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MAY 3rd, 1945

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THE BRISTOL AEROPLANE COMPANY LIMITED

FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Exit Göring

IT has been said that in the palmy days of Nazi rule Hitler conceived all the broad plans, but had not the faintest idea how to put them into practice. For this he always called in Göring, who was a gifted practical organiser. Surprise has also been expressed at the intense devotion manifested by the haughty Prussian junker for the little Austrian sign-painter, but so it was. In many an emergency, such as the first attempt to revolt against the Nazi regime, which was quelled by the so-called "blood bath," Göring was Hitler's *alter ego*, and was trusted implicitly.

As chief of the *Luftwaffe*, Göring will not be remembered as a great leader in war. If it was he who brought it about that the *flak* units and the searchlights should belong to the *Luftwaffe* instead of to the Army, then he deserves credit for a sensible piece of organisation, established in peace and proved in war. Allied pilots will be the first to admit that the shooting of the *flak* gunners was very good. In Britain the Air Ministry was not responsible for air defence from the ground, while the War Office had neglected a force which it regarded chiefly as a nuisance.

We must presume that Göring was chiefly responsible for training the *Luftwaffe* to be solely an ancillary to the Army. That plan of campaign seemed justified in the invasion of Poland and France, chiefly because of its novelty and through the moral effect produced by the Stuka dive-bomber. But when it came to using *Luftwaffe* bombers independently in an attempt to master the Fighter Command of Britain, the *Luftwaffe* failed completely and ignominiously. Again we must presume that Göring was chiefly responsible. He had adopted the theory that a bomber's best defence was speed, not armament, and had put the Heinkel and Dornier bombers on large-scale production. They fell in swarms before the Hurricanes and Spitfires. He seems to have divided his attack into stages and laid it down beforehand that stage 1 must end on such a day and stage 2 must start next day—regardless of whether stage 1 had achieved the purpose which alone would justify the change to stage 2. The result is known to all the world, and as a fighting leader Göring must go down to history as an outstanding failure. His retirement at this stage of the war is a matter of no importance. If his heart disease takes him before a Higher Tribunal before he falls into the hands of the Allies, he may be accounted lucky.

The Big Bomb

IT is evident from our Correspondence columns that the real significance of the ultra-big bomb is still not realised in some quarters.

Apart from very deep tunnelling in mountain sides there is, at the moment, no target which can be considered safe from destruction. The huge concrete strongpoints many feet thick—which are so beloved of the Germans—can be penetrated or pulled up from their foundations, and the blast and concussion is such that every living thing inside is killed.

In air/sea warfare the picture is the same. A ten-ton bomb exploding 50 or 60 feet below the bottom of any vessel will either blow the bottom in or turn the vessel over.

The naval ships at present in service have been built to withstand torpedoes with a warhead of explosive weighing a mere 600 lb., and with armour plate to hold up against the impact of shells weighing less than a ton. In view of the probable development of the big bomb in the future, it seems that self-righting devices such as are found on lifeboats would be more useful than armour plate.

Speed, range, height of operation and accuracy of aiming by instrument have all increased or progressed under the stimulus of war. It is probable, long before the ships now being laid down are finally paid off, that there will not be a spot on the face of any of the oceans which cannot be reached by the long arm of air power with its terrible striking force.

The big bomb for special purposes has always been in the minds of our air staff. It was only the sudden collapse of Germany in the last war which prevented the employment of 3,300 lb. bombs which were to have been dropped from specially adapted four-engined V/1500 Handley Page bombers. This was the embryo of to-day's special Lancaster carrying a 22,000 lb. bomb. The Lancaster with a 22,000-pounder on board is the embryo of what?

Taking the Sword

NEVER in all history has the truth of the biblical quotation, "All they that take the sword shall perish with the sword," been so apparent as it is in the plight of the German nation to-day. When we remember how much good the Germans could have given to the world—they are brilliant in so many ways—it is a great tragedy to see such cleverness used to such ill purpose.

Even the intention to live by the sword as *Herrenvolk* has led them to establish the concentration camp which has brought in its train the condemnation of being "the lowest point in human degradation." Truly this is a perfect example of eternal wisdom bringing to nought the wrongful efforts of human cleverness.

All their industry has lived by making "swords" of one sort or another with the object of bringing other nations into subjection. Our war correspondent describes on another page how a large section of this industry, which lived by the sword, has been totally and utterly destroyed by the clean sword of the Royal Air Force.

The Ruhr, the largest manufacturing centre on the Continent of Europe which, with its 2,000 anti-aircraft guns and its innumerable night fighters, the Germans boasted was immune from air attack, is now "a desert of rust and rubble." Years must elapse before a return to anything like normal production can happen; many of the towns of the Ruhr are so badly damaged that it would probably be easier to build new towns on adjoining sites rather than repair the old.

In passing, there is one important point which should be remembered. Eventually there will come a time when these German factories are rebuilt, and they will perforce be equipped with new and up-to-date machinery. In competition we shall still be using our old factories and old equipment. This must be borne in mind because it will apply to the aircraft industry equally with other trades.

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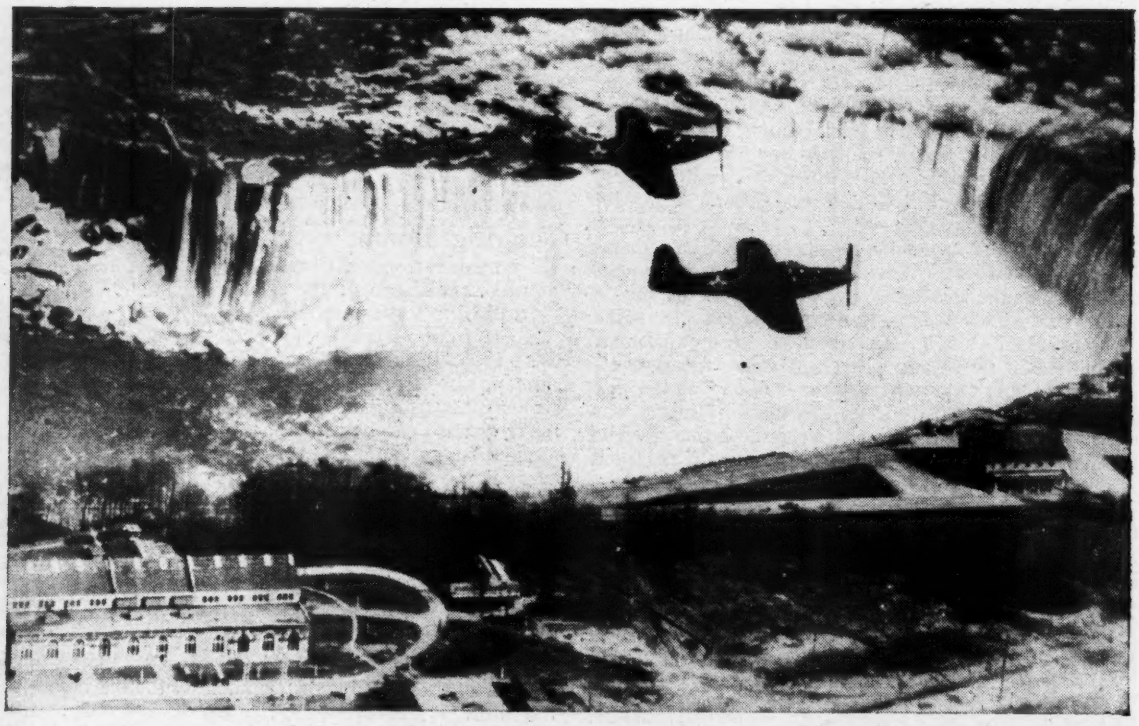


FOR NORTH-WESTERN PASSAGE: Lend-Lease Bell P-63 Kingcobras passing over the Niagara Falls whilst flying to Fairbanks, Alaska. At Fairbanks, Russian pilots take over and fly the aircraft to the Eastern Front via Siberia.

Coastal Command Mosquitoes shooting down German torpedo aircraft which they met about 150 miles off the Scottish coast when the Mosquitoes were returning from an anti-shipping sortie in the Kattegat. Nine out of 18 were shot down.

WAR in the AIR

Berchtesgaden Shattered : Spitfires Over Berlin : Burma Oilfields Recaptured : Göring Retires

THE bombing by Lancasters of Hitler's Berchtesgaden chalet, the S.S. barracks near by, and another dwelling of Hitler's on a mountain spur five miles away, is a sign that the need for strategic bombing is nearing its close. Berchtesgaden doubtless could have been bombed before, though it was not easy to find when Bomber Command's operations were limited to work by night. Now the number of targets whose destruction would seriously impede the German war effort has been enormously reduced, and Bomber Command can afford to allow itself some little treats. It visited Hitler's houses on the morning of April 25th, and used 12,000-lb. bombs, fused for deep penetration, against the two houses of the Führer. Smaller, but still quite substantial, bombs of 4,000 lb. and 1,000 lb. were used against the S.S. barracks. Mustangs of Fighter Command and also of the U.S. 8th Air Force escorted the Lancasters, and the bombing was observed to have been accurate.

The Germans have been proclaiming so loudly that Hitler himself is in Berlin that one feels inclined to remark "the lady does protest too much." No report that anybody has seen him there has come through at the moment of writing. He has himself proclaimed that the two places which must be held at all costs are Berlin and Prague. The choice of the latter is a surprise; but the result is that if Hitler is to appear anywhere else than in Berlin it must be in Prague—or else he will lose face. He might have preferred the "redoubt" in the Bavarian mountains; but that will be less attractive now that his two homes have been bombed.

The Skoda armament works at Pilsen in Czechoslovakia were one of the few production centres still worth a hearty effort to destroy, and Fortresses dealt with them on the same day as the attack on Berchtesgaden. Before the raid Allied H.Q. took the unprecedented step of broad-

NO ROOM FOR MISTAKES: The deck of escort carrier H.M.S. *Smiter* appears very small when seen from the cockpit of a Swordfish about to land.

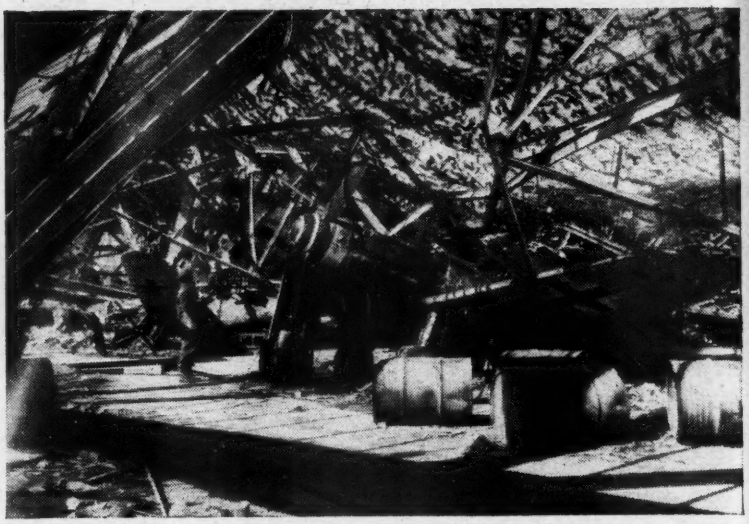
WAR IN THE AIR

casting a warning that Skoda might be the target for the Allied bombers. This was done so that the slave workers should have time to get out of the way. Germans, of course, could do the same; but that would not matter so much. They will be rounded up in time.

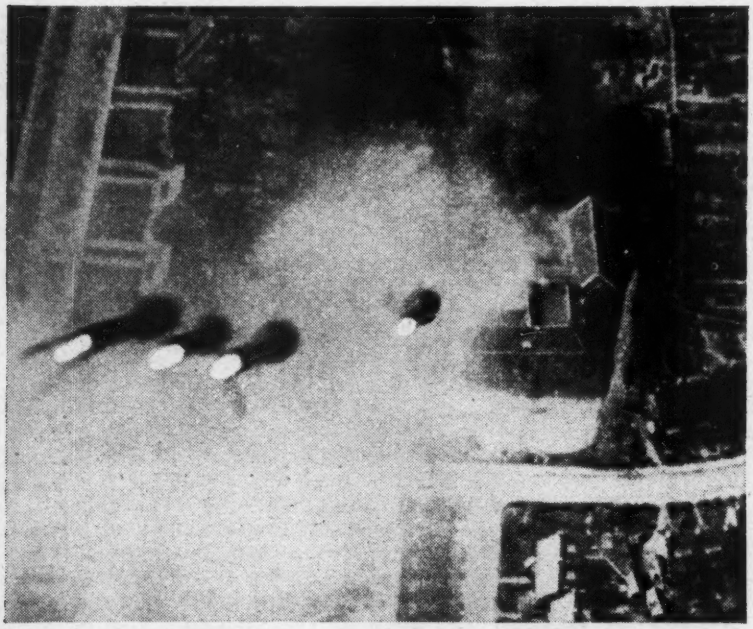
Over Berlin

SPITFIRES have joined the Russian fighters over Berlin, providing top cover to the Stormoviks which have been bombing targets in the city. No doubt a large proportion of the remaining force of German fighters has been congregated over the capital, and probably they are flown by the best pilots that the *Luftwaffe* could muster. The Russian machines must outnumber those of the Germans; but in performance the latest marks of Me 109 and Fw 190 rank high among the fighters of the world. They do not, however, rank so high as the Spitfire, and the presence of this magnificent fighter must be a great help to the Russian pilots, and to the ground troops who every now and then need protection from the attacks of German aircraft. Aircraft do not usually play a dominant part in street fighting; but every now and then they may be called upon to blast a strong point.

Other British aircraft had a fine time last week when they found long streams of transport, nose to tail, heading for Berlin from the north-west. They fell upon the vehicles, and did much damage. Up to the last moment the Germans tried to hurry as many troops as possible into Berlin to strengthen the garrison; but shortly after this incident the Russian armies from the north and the south made contact in the neighbourhood of Potsdam, and completed the encirclement of the city. Further ingress or egress thus became impossible, except by air—and that must at best be a risky business. Quite possibly, by the time these words are published the Russians will have occupied the Templehof airfield.



PRODUCTION HOLD-UP: Part of a Blohm and Voss aircraft factory near Hamburg after the R.A.F. had finished with it. Forced labour employed was housed in a wired camp adjoining.



NOSES WELL DOWN: From the angle at which these rockets are on their way to a German H.Q. at Arnhem it is obvious that the attacking Typhoons were diving at more than 70 degrees.

There was a time when the retirement of Marshal Göring from the command of the *Luftwaffe* would have been news of the greatest interest. Now it seems of very small importance. Judging by his bulk, one is not surprised that his heart should be in a serious condition. As chief of the *Luftwaffe*, he will go down to history as one who was willing to be utterly ruthless in the employment of bombers, but who was not competent to carry out even a ruthless policy to an effective end. He bungled. Probably his chief claim to a place in history is due less to his connection with the *Luftwaffe* than to the aid he gave to Hitler in carrying out all sorts of internal schemes. He was the Führer's right-hand organiser, and in suppressing opposition he was restrained by no scruple.

Captures

MANY places have fallen to the arms of the Allies since last week, and doubtless more will fall before these words are published. Stettin, for example, must have been pretty well in the hands of Marshal Rokossovsky before the attack on Berlin was launched. The capture of Brno, from which the Bren machine gun took its name, was a good piece of work, following, as it did, hard on the bombing of the Skoda works at Pilsen. More significance attaches to the capture of Bremen in the north and Verona in the south. The former is a port which the Allies needed for the importation of supplies now that the armies have got so far away from Antwerp. Verona is described as the key to the Brenner Pass. The railways and bridges leading from that pass have for a considerable time past been under repeated bombing attacks by

WAR IN THE AIR

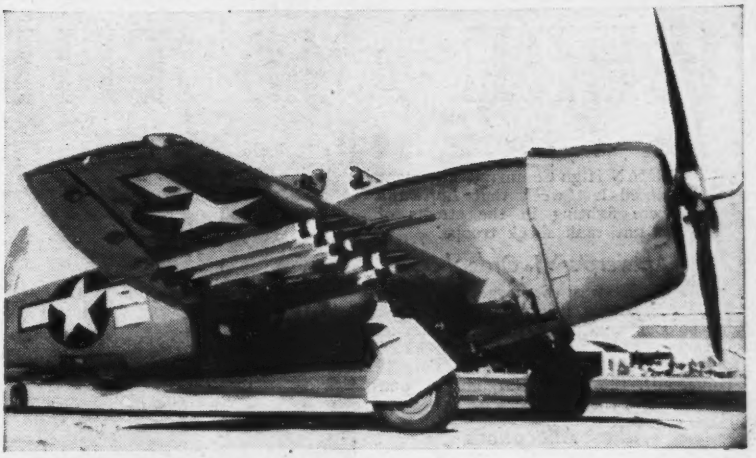
Mediterranean aircraft; but the Germans are remarkably clever at repairs, and it is better to hold the key town. We hope the "Two Gentlemen" have not been incommoded.

Now it remains to be seen whether any substantial number of the Germans in Italy will be able to make their way to the "redoubt" in Bavaria, if Gen. Patton's armour does not overrun the whole area first.

A captured German General has said that the defeat of his country was due mainly to shortage of lubricating oil. Shortage of petrol must have been at least a good second. A British pilot recently complained that now it was not so easy to set fire to German aircraft on the ground, as they had no fuel in their tanks.

Japan and Oil

JAPAN must also be feeling the want of petrol, or at least is likely to do so soon. The Burma oilfields have been recaptured by the 14th Army, but they are said to be in a deplorable state, not only from Allied "scorched earth" operations at the time of our retreat or from recent bombing, but also from three years of neglect by the Japanese. That is hard to understand. Perhaps the war lords thought that they had such a fine supply in the Dutch West Indies that they need not worry about that in Burma. Now British engineers will get busy on the plant and try to get it back into working order as soon as possible. In the meantime the 14th Army has captured much booty in the town of Toungoo, including 24,000 gallons of petrol.



CLIPPED-WING THUNDERBOLT: The latest Thunderbolt, P47N, has squared-off wing-tips and greater aileron area to improve manœuvrability. New type rocket holders replace the tubes used on previous models.

SINECURE APPOINTMENT: Col. Gen. Ritter von Greim who has been appointed commander-in-chief of the non-existent *Luftwaffe* in place of Reich Marshal Göring who has retired.

The War in Italy

SIMULTANEOUSLY with the subjection of Germany by the forces of General Eisenhower and Marshal Stalin, the troops of General Alexander, fighting under the direct command of General Mark Clark, defeated and broke up the German armies in Northern Italy. On ahead of them the Italian partisans came into the open and arrested and executed Mussolini and many of his Fascist councillors.

Mussolini is certainly a figure in the history of air war. He was an enthusiastic pilot himself; but the chief interest of his air work lies in his plans for dominating the Mediterranean (*mare nostrum*) by air. The late Marshal Balbo probably shares in the responsibility for the plans. It was decided that aircraft carriers were not necessary in the inland sea. It was believed that long-range bombers, with numerous bases in the Dodecanese and elsewhere, could dominate the whole sea and forbid it to the British Navy. Well, that plan did oblige us to send our troopships and supply ships all round the Cape to the Middle East. But we held grimly on to Malta, and the Royal Navy always contrived to keep that heroic island supplied with the means to break up the Axis plans. We found carriers invaluable in the Mediterranean.

It is impossible to say, at the moment of writing, whether by the time these words are published, Germany, led by Himmler, will have formally surrendered to the three great Allies of the United Nations. In any case the German armies are now (to use an expression from whaling) in their flurry—that is to say, the final agonised writhings of the harpooned whale before he dies.

OFF THE SECRET LIST: A captured German jet fighter being examined by the R.A.F. The enemy attempted to destroy this Me 262 with two Jumo turbine-compressor units before Canadians overran the airfield. The picture shows part of the eight-stage axial compressor which is used in conjunction with a single turbine wheel.

HERE AND THERE

Grounded

A GERMAN High Command statement disclosed last week that *Luftwaffe* crews were fighting in the streets of Berlin as anti-tank shock troops.

Antwerp's V1 Ordeal

ANTWERP was the target for 9,000 flying bombs, it was stated last week in the Belgian Chamber of Deputies at Brussels. Among the 3,000 people killed during these attacks was M. Camille Huysmans, the port's Burgomaster and a member of the Chamber.

Allies' Allocations

OF the 32,000 American aircraft of all types delivered to the Allies up to the end of 1944, Great Britain has received 8,500; Russia 12,000; China, India and the Australian theatre 6,500, and the Mediterranean area (including France and Africa) 5,000.

In the Field

AIR MARSHAL SIR ARTHUR CONINGHAM, A.O.C.-in-C. 2nd T.A.F., last week presented decorations to three pilots of a Norwegian wing which has a confirmed score of nearly 200 enemy aircraft destroyed. The presentation was made on an airfield captured from the Germans in Holland.

U.S. Award for Air Marshal

AIR MARSHAL SIR FRANCIS JOHN LINNELL has been awarded the U.S. Legion of Merit in the Degree of Commander "for exceptionally meritorious conduct in the performance of outstanding services as Deputy C.-in-C. of Mediterranean Allied Air Forces."

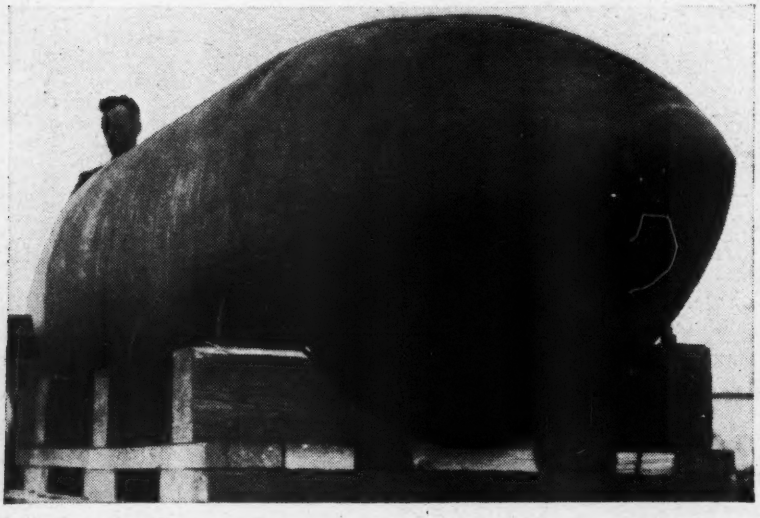
The citation reads: "For seeing the need for co-operation and team work in the problems of combined operations Air Marshal Linnell proceeded to create a highly efficient organisation to hasten the accomplishment of that mission."

SEEING THE RESULT: Workers at the Abingdon factory of M.G. Cars Ltd., where certain major parts of the Tempest are made, were recently given a flying display by a squadron of these famous Hawker fighters. Sir Stafford Cripps suggested the idea and made arrangements with the Air Ministry. The pilots of the squadron were, in their turn, shown over the aircraft shops at the works.

General Spaatz Decorated

GEN. CARL SPAATZ, chief of the U.S. Air Forces in Europe, was decorated last week at St. Germain-en-Laye with the Insignia of Grand Officer of the Legion of Honour by Gen. Bouscat, Inspector-General of the French Air Force.

A number of other U.S.A.A.F. and U.S. Army officers were also decorated with the Legion of Honour and the Croix de Guerre.



TEN-TON TESSIE: The warhead of the R.A.F.'s 22,000-lb. bomb loaded on a lorry specially built to carry such loads. The vehicle is an articulated ERF, driven by a 90 h.p. direct-injection compression-ignition engine. Armourers fit the tails of these mighty bombs just before bombing-up.

Veteran's Record

THE veteran Martin flying-boat, *China Clipper*, which was wrecked shortly after the tenth anniversary of her maiden flight from Chesapeake Bay, had run up more than 12,000,000 passenger-miles and 1,000,000 ton-miles.

Her end came when she struck a blacked-out boat during a night landing.

X-ray in Industry

EQUIPMENT for determining residual stresses in metals was the special aspect of the paper read by Dr. R. F. Hanstock, of High Duty Alloys, Ltd., at the 1945 conference held in London recently by the X-Ray Analysis Group of the Institute of Physics. The conference occupied two days and was opened by Professor Sir Lawrence Bragg, chairman.

U.S. Air Appointments

U.S. War Department has announced the appointment of Lt. Gen. Barney M. Giles as commanding general of the U.S.A.A.F. in the Pacific Ocean area, in succession to Lt. Gen. Millard F. Harmon, recently reported missing.

Gen. Giles will be replaced as Chief of U.S. Army Air Staff by Lt. Gen. Ira Eaker, former commander of the Mediterranean Allied Air Forces, and Lt. Gen. John K. Cannon, commander of the 12th Air Force, succeeds Gen. Eaker.

A.T.C. Cadets at Biggin Hill

OVER 400 cadets from South-East Command, A.T.C., took part last week in a memorial church service and special St. George's Day parade at

HERE AND THERE

R.A.F. Station, Biggin Hill, the famous fighter station of the Battle of Britain.

The service was held in St. George's Chapel, dedicated to the pilots from this sector who lost their lives in combat. The salute and march past was taken by Air Vice-Marshal Cole-Hamilton, A.O.C. No. 11 Group, R.A.F., and the depot band of the R.A.F. Regiment was present.

Mobile Air Bases

MOBILE air bases have been established in Australia by the Fleet Air Arm for remobilising Seafire, Firefly and Hellcat squadrons operating against the Japs.

Everything at these bases is portable except the hutments; the radio installations are in huts which are really large packing cases that can be hoisted on to trucks, and the hangars are of steel tubes and canvas.

As the Fleet moves, these bases will pack up and follow.

New East Africa Air Chief

BRIGADIER H. G. WILLMOTT, of the South African Air Force, assumed command of the R.A.F. in East Africa last week.

He succeeds Air Vice-Marshal Sir Brian Baker, who is appointed Senior Air Staff Officer of the R.A.F. in Middle East.

Ivelaw-Chapman Freed

AIR COMDRE. R. IVELAW-CHAPMAN, C.B.E., D.F.C., A.F.C., after nearly a year as a prisoner in Germany, has returned to England. A base commander of R.A.F. bomber stations, he took part in an operational flight over France before D-Day "to see for himself," and during the flight he had to bale out.

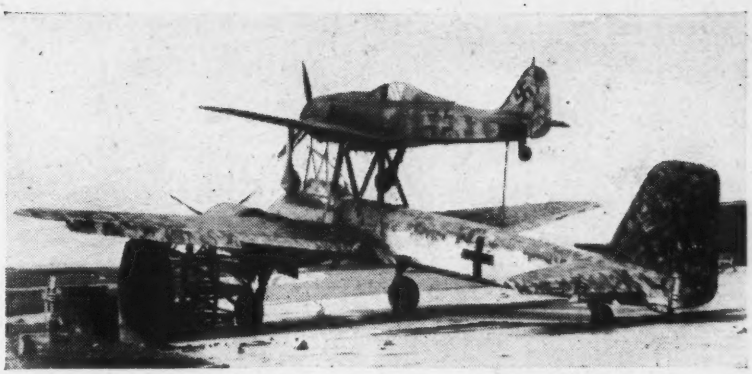
Air Comdre. Ivelaw-Chapman, who is 46, was decorated for valuable service in artillery co-operation in France in 1918. In 1929, as a flight lieutenant, he was ordered to fly with another R.A.F. officer to Kabul to rescue Europeans. Engine trouble forced the aircraft down, and the two airmen were surrounded by armed Afghans, who took them as political prisoners.

For some years he was in the Directorate of Operations and Intelligence at the Air Ministry.

Another "Smithy" Decorated

WITH the award of the D.F.C. to Flt. Lt. Peter Kingsford Smith, R.A.A.F., the second of the three flying nephews of that most famous of all Australian airmen, the late Sir Charles Kingsford Smith, has been decorated. His youngest brother, Wing Cdr. Rollo Kingsford Smith, already holds the D.S.O. and D.F.C. The third of the three brothers, sons of Mr. W. Kingsford Smith, is serving with the R.A.A.F. in the Pacific.

Flt. Lt. Kingsford Smith's award seems somewhat tardy recognition of his "exceptional determination," for he was taken prisoner nearly two years ago, and the award takes effect as from February 19th, 1943.



IMPOSITION: The manner of mounting the piloted fighter on the "expendable" bomber is shown in this picture from a captured German airfield. The undercarriage of the Fw 190 evidently can clear the supporting trestle on the Ju 88 and be normally retracted after the upper component has been hoisted into position. Note the bracing beneath the tail.

Pauline Gower to Marry

MISS PAULINE GOWER, Senior Commander in the A.T.A., is soon to marry Wing Cdr. William C. Fahie, of Dublin. Miss Gower, who is the younger daughter of Sir Robert Gower, M.P. had her first flight in an aircraft as a 12-year-old schoolgirl, obtained her "A" licence at the age of 17, and became an owner-pilot when she was 21.

It was she who started the women's section of the A.T.A. with seven other women pilots, and became director of women personnel. Then in 1941 she visited America to help organise a women's ferry service to fly U.S. aircraft to Canada en route for Britain.

Before the war Miss Gower became famous throughout the country for her air circus, which she ran in association with Miss Dorothy Spicer, Britain's first fully qualified woman aircraft engineer.

Flight offers its congratulations and best wishes to Miss Gower and Wing Cdr. Fahie for their "dual control" future.

Locos Fly to Burma

EIGHTEEN 5-ton, metre-gauge locomotives have been flown from America to Burma in 27 transport aircraft, and are the first railway engines ever to travel by air, says a Reuter message from Washington, quoting the U.S. War Department.

They were built in 92 days and delivered by air in response to a wire from Burma asking that the locomotives, already approved through lend-lease, should be expedited to help keep up the British advance.

This is a new interpretation of "railway air services"!

WOT PROP ?

Mathis Multi

A 42-CYLINDER Mathis engine which develops 2,300 h.p. at 2,000 r.p.m. for a weight one-third that of any other known engine of equivalent power, was shown at a Paris exhibition recently.

This engine comprises six 7-cylinder radial units on one crankshaft and would appear to be very similar to the Swedish Mannerstedt engine which was illustrated in *Flight*, January 6th, 1944.

The Mathis engine was designed in 1937, flew 100 hr. in 1939, and is reported now being built in numbers, together with a new engine on the same principle but of about twice the power.

Trade Announcements

CONSEQUENT upon the death of their chairman and director, Mr. F. S. Thompson, the board of Thompson Bros. (Bilston), Ltd., has appointed Mr. H. J. Thompson chairman and managing director, and Mr. J. W. Meredith assistant managing director.

* * *

By a special resolution and with the approval of the Board of Trade, the firm of Field Aircraft Instruments and Equipment, Ltd., has been changed to that of Bryans Aeroquipment, Ltd. No change in the company's policy is involved.

* * *

The Manchester office of the British Aluminium Co., Ltd., is temporarily located at Chancery Chambers, 55, Brown Street, Manchester, 2, and is under the management of Mr. J. R. Whitelegg. (Tel. Blackfriars 8913.)

* * *

The reconstructed board of the Aero Piston Ring Co., Ltd., following the acquisition of its share capital by Specialloid, Ltd., has Mr. H. N. Bates as chairman and Mr. R. H. Hainsworth as managing director. Messrs. A. C. Richards, C. F. Russell and E. B. Graham are also directors. Mr. C. G. Downing has been appointed general manager, Mr. H. A. Kemp continues as works manager, and Mr. F. R. Patterson is production manager.

Private Owner Designs

First Prize Winners of an American Competition for the Design of a Post-war Family Aircraft

A DESIGN competition for the ideal private aircraft for the personal use of Mr. and Mrs. America was promoted by *Popular Science*, the oldest science magazine written for the general American public; and the designs submitted, which came from every State in the Union as well as from other countries, numbered no fewer than 3,345. Two categories of entry were open: (1) for professional designers, and (2) for amateurs; but, apart from this, there were no restrictions, and the goal was the same for each.

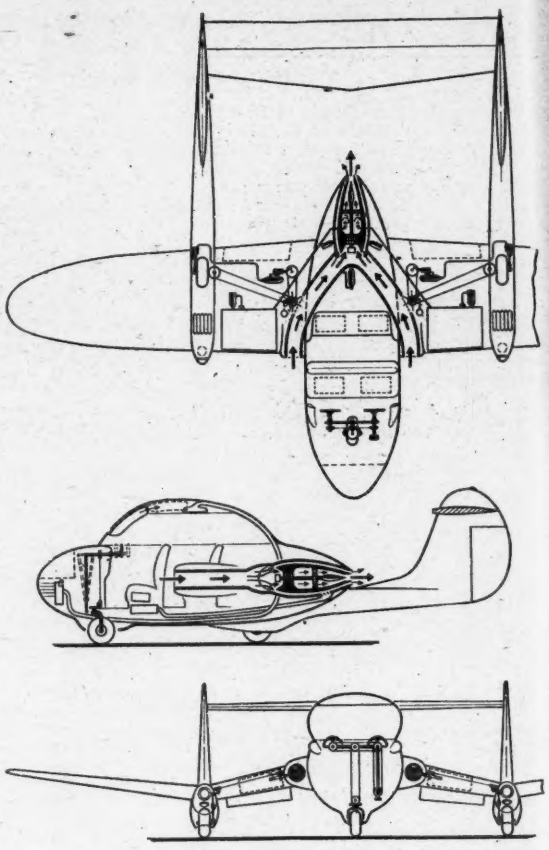
There can be little doubt that such a competition as this provides a first-class fund of data on exactly what the general public wants the post-war family aircraft to be. In general, the American public most wants safety, comfort, good looks, practicability and performance, which, of course, could equally be said of this nation, although not necessarily in that order.

Perhaps the most intriguing aspect of the designs submitted was the high percentage of contestants who used twin tail booms enclosing pusher propellers, the idea behind this layout being that maximum visibility is afforded pilot and passengers and, at the same time, a safety factor is provided by the booms acting as a barrier against people walking into the propeller whilst the machine is on the ground. We must agree that these points are extremely valid.

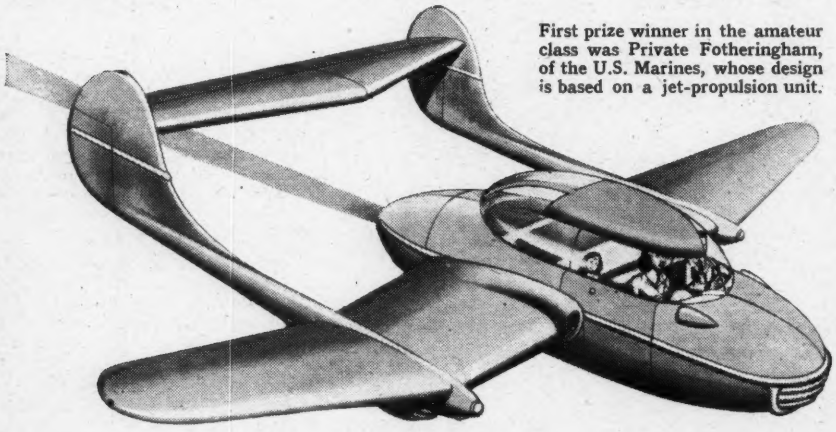
Another interesting point which seems to emphasise that Britain is a long way from America is that most contestants preferred aircraft in the $1,500 to $3,500 class by which good performance can be obtained as against a purchase price of less than $1,000, which is the price class used up to the present in appealing to the American public.

Amateur Designers Predominate

The general run of the designs specified speeds of between 135 and 144 m.p.h., a range of about 500 miles; horsepowers between 120 and 137; low-wings in preference to high- or mid-wings, tricycle undercarriages; and, in many instances, slots and flaps. Contestants were divided as between professionals and amateurs, with the latter outnumbering the former by about 15 to 1. Some other interesting data obtained from the analysis are as follows:—



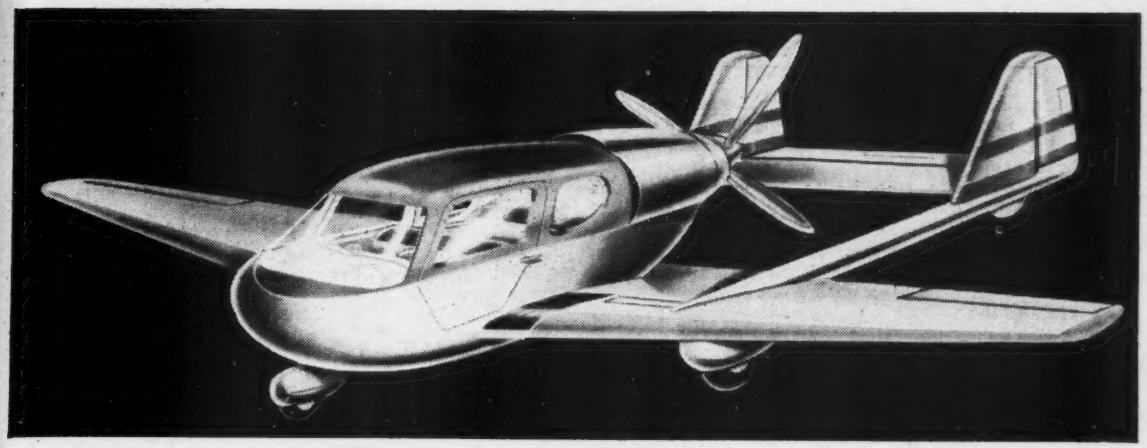
	Professional Percentage	Amateur in favour
Amphibious aircraft	20	16
Good taxying qualities	12	10
Retractable undercarriages	53	72
No. of seats 4	43	52
,, ,, 2	35	32
,, ,, 3	11	13
,, ,, 5	7	1
,, ,, 6	4	1
Radio equipment	33	32
Folding wings	7	14
Non-spinning qualities	16	14
Two-control	6	8
Engine self-starter	14	16
Twin engines	20	29
Extra luggage space	80	35



First prize winner in the amateur class was Private Fotheringham, of the U.S. Marines, whose design is based on a jet-propulsion unit.

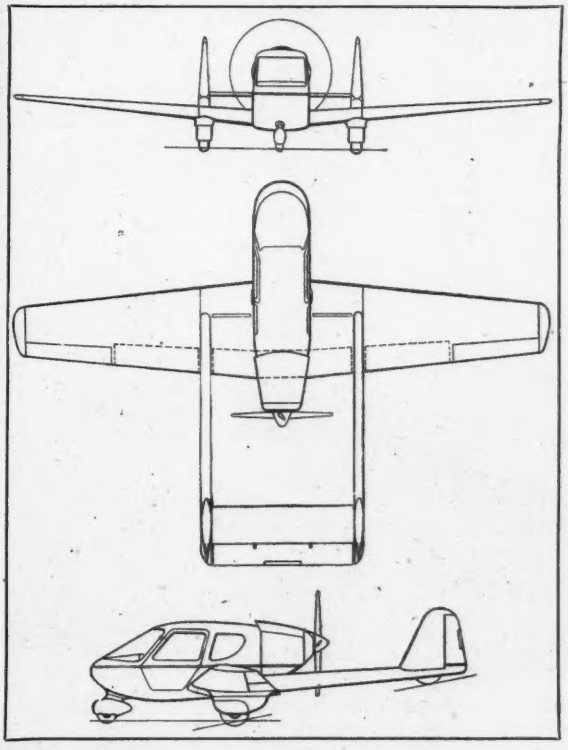
Few designers wanted rotary-wing types; 53 and 72 per cent. respectively specified tricycle undercarriages, and 40 per cent. of each class included slots and flaps. The latter seems to indicate that there is a keen appreciation of devices to maintain aileron control at the stall point and allow of tractability with low-speed landings.

A study of the first prize winners in each class is somewhat illuminating. The winner of the amateur category competition is a 19-year-old U.S. Marine Corps private, D. L. Fotheringham, who submitted a design conforming to the general trend, with



Mr. Donald J. Wheeler, winner of first prize in the professional class, has produced a very sleek pusher, but the tail might have a rather unhappy time so close to the airscrew.

the important exception that it incorporated a jet-propulsion power unit. Presumably the judges were tacitly accepting the evident modernity of this contestant's outlook when awarding him first prize, for from an examination of his design, it is clear that, as he says himself in the "Designer's Remarks," Mr. Fotheringham knows little about the propulsion system he has specified. Nevertheless, in addition to reaction propulsion, the design embodied anti-collision devices, a television screen for "thick-weather" navigation, and push-button radio station selection. This contestant is certainly uninhibited by conservatism, and this, we feel, is a very good thing. Quite palpably the design is one in which every conceivable "up-to-the-minute" device is lavishly incorporated, and were the design placed in the hands of a capable and progressive aeronautical engineer, there is little doubt that, with modification, it could be made to work, and a startlingly appealing little machine it would probably prove.



PROFESSIONAL DESIGN

Wing span	36ft. 10in.
Wing area	153 sq. ft.
Aspect ratio	6
Wing loading	15 lb./sq ft.
Length	25ft. 9in.
Power-plant—Lycoming 290-A 130 b.h.p. (or similar Continental or Franklin engines)	
Power loading	17.6 lb./h.p.
Useful load:	
Four passengers—170 lb. each	680 lb.
Baggage—40 lb. per passenger	160 lb.
Fuel—30 gallons—6 lb./gal.	180 lb.
Oil—5 quarts	10 lb.
Total	1,030 lb.
Empty weight	1,260 lb.
Gross weight	2,290 lb.
Fuel consumption	7.35 g.p.h.
Cruising range	475 miles.
Top speed (sea level)	130 m.p.h.
Cruising speed—75 per cent. power (sea level)	115 m.p.h.
Cruising speed—60 per cent. power (sea level)	103 m.p.h.
Landing speed	45 m.p.h.
Take-off run (25 deg. flap)	640ft.
Take-off run (no flap)	810ft.
Rate of climb (sea level)	800 ft./min.
Service ceiling	13,000ft.
Absolute ceiling	15,400ft.

Mr. Donald J. Wheeler, the winner of the professional class, is an engineer with the Boeing Aircraft Company, and he somewhat naturally produced a design of an essentially practicable nature without, however, indicating that he is in any way a slave to convention. Mr. Wheeler's machine is also a four-seater, pusher, twin-boom, tricycle, low-wing monoplane, but the designer has specified a restriction of elevator movement in order to prevent the angle of incidence exceeding 16 degrees. This is a theoretical measure which sounds excellent, but, at the same time, might prove uncomfortably otherwise in practice. So long as flight within normal bounds is being enjoyed, elevator restriction would probably not obtrude, but it is felt that all people who fly find themselves in more or less sticky situations sooner or later, and when such circumstances do arise, restriction of a control movement is the least desirable thing. The designer says, in his remarks, he feels that, if thousands of laymen are actually going to fly, manufacturers will have to abandon conventional stallable types of aircraft and offer attractive, useful and completely safe models. He also goes on to say: "... the average man does not want to have to spend a year to learn to fly and carry passengers, nor spend all of his weekends keeping in practice and co-ordination to fly conventional stallable aircraft."

Mr. Wheeler's views represent one school of thought, but there is something to be said for those of the opposing school. It may not necessarily, we feel, be a very good

PRIVATE OWNER DESIGNS

thing for thousands of people to take to the air when competent only to fly in a very restricted sense, at least if a considerable number is to go on later to more advanced and difficult types.

The winning design embodies a fixed tricycle undercarriage neatly faired because the designer anticipated that, as the aircraft is intended for comparatively inexperienced pilots, the possibility exists that a retractable gear might be forgotten and a belly landing result. He has taken steps to avoid this—a good point. Another feature "built in" to the aircraft is stable loading, with its advantageous effect on trim. It is claimed that the c.g. falls approximately midway between the pilot's seat and the engine, so that overloading results only in a higher wing loading and gross weight, with slightly reduced load factors. Practical effects of this will, however, need to be demonstrated before the limits can accurately be assessed.

Relevant data and estimated performance for this design are tabulated, but a power loading of 17.6 lb./h.p. seems rather on the high side—possibly we have been spoiled by Service aircraft, but an adequate power reserve is a very attractive quality.

Summing-up, we are glad to have had the opportunity to review the winning designs of this very topical competition, for each of the contestants has produced a provocative, go-ahead design. There is, undoubtedly, every incentive for the manufacturers to give the public sound, safe, attractively styled private aircraft.

BRITISH AIRCRAFT AMBASSADORS

THE Council of the Society of British Aircraft Constructors has announced its intention of establishing an Export Section with headquarters in London and branch offices in the main potential markets abroad.

There can be no doubt of the pressing need for such an organisation, and the sooner it can be formed into an operative force the better for the country. Due to ill-informed comment in the recent past there is a wholesale impression, both at home and abroad, that the British aircraft industry is incapable of producing aircraft for world markets for some considerable time to come. This view is very wide of the mark. Certainly it is true that the industry's war commitments have imposed a great restriction on its ability to produce civil aircraft in competition, on a time basis, with, for example, America. But those restrictions are vanishing, and such is the nature of our aircraft industry that it can, and will, produce really competitive commercial aircraft types to appeal to the overseas markets within the very near future.

The potential overseas buyers want to buy British—they know our quality. But in the face of highly organised sales propaganda from across the Atlantic they have gained the erroneous impression of our stultification.

Mr. F. G. Miles, head of Miles Aircraft, Ltd., is the first chairman of the S.B.A.C. Export Section and, we feel, he is an excellent choice for the job. Mr. E. C. Bowyer has been appointed executive-in-charge, which position he is undertaking in addition to his other work in the Society.

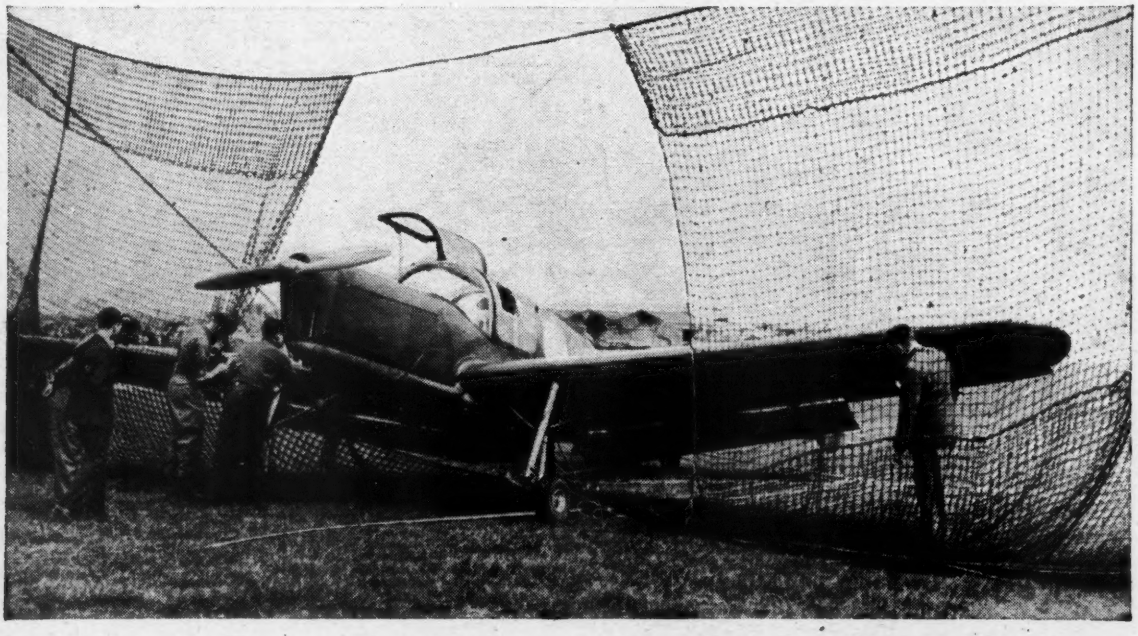
The Export Section will exist to act as a central liaison between the overseas markets and the home production—a two-way liaison. It will not supersede individual firms' own overseas representatives, as it will in no way be concerned with contract negotiation, price settlement, shipping details, etc.; these will remain the companies' responsibilities. What the Export Section will be concerned with, however, is keeping a finger on the pulse of potential markets, relaying this information back, supplying all possible information to the national markets as to the capabilities of the British aircraft industry, which includes not only aircraft and engine manufacturers, but those concerns dealing with accessories, equipment, and raw and semi-fabricated material. In fact, the prime purpose of the new venture is to *sell* Britain's aeronautical industries to the world, and, in turn, to sell the world air markets to Britain's industry.

Cordial approval and support of the Government has been accorded the Society's initiative in this new venture. We wholeheartedly agree that probably no other proposed scheme is so deserving of the utmost official and commercial support.

Britain's post-war trade will, to a great extent, be bound up with the air, and that trade is our life. It must be furthered to the limit.

The cost of the organisation is being shared by all members of the society. Naturally, the greater part of the expenditure is being borne by the aircraft and engine companies, but very substantial help is being given by the accessory and material manufacturers who make up the S.B.A.C. associate membership.

This is a grand venture, and it comes not a moment too soon. We look forward to the results.



PRACTICE AT THE NETS: The sturdiness of the Miles airframe was proved when this M.38 was flown into a vertical net (with a gap for the airscrew) and pancaked to earth without damage.

New Fifth Sea Lord

THE appointment of Rear-Admiral Thomas Hope Troubridge, D.S.O. and Bar, R.N., to the important tasks of Fifth Sea Lord in succession to Vice-Admiral D. W. Boyd, C.B., C.B.E., D.S.C., R.N., marks an end to the slur of the Navy's air arm being run by un-air-minded admirals. It is an appointment which has already received wide approval and provoked confident hopes of an ascendant future for naval aviation.

Rear Admiral Troubridge has no call to rest on the honours of his famous ancestor, who was one of Nelson's admirals, since on his own merits he has achieved great distinction. Now just over 50, he has a long record of sea and air service. He entered the Navy in 1908. He has served in leading battleships, the *Victoria and Albert*, commanded destroyers and aircraft carriers, as well as serving for two years ending February, 1935, as Naval Attaché in Berlin.

His true genius for leadership came to the fore in a series of combined operations and landing forces. He was in command at the 5th Army landing at Nettuno in January, 1944. This task was followed by a much more important mission, the command of the carrier forces covering the S. France landings in August, 1944, from which sprang the liberation of the whole of Southern France. In October, 1944, he was in command of naval forces in the Ægean during the relief of Athens, with a powerful force of cruiser, carriers and destroyers.

Escort Carriers Vindicated

The South France carrier actions were of especial interest in that they effaced the bad name given to escort carriers at Salerno. At that place, conditions of flat calm had mitigated against successful operations of these ships—for though the tasks of Salerno were achieved there were many flying accidents which resulted in adverse rumours.

For the South France show special rehearsals were made off North Africa, and the task force comprised the battleship *Ramillies*, six modern cruisers, two gunboats—*Aphis* and *Scarab*—all manner of corvettes, minesweepers, landing craft and the escort carriers *Khedive, Pursuer, Emperor, Searcher, Attacker, Hunter* and *Stalker*.

The degree of air support afforded by these carriers in the period August 15 to 23 is striking. On average, one aircraft took off every six minutes between dawn and dusk. Each pilot on average flew 2,300 miles. Total distance flown by all aircraft was 275,605 miles.

Since aircraft carrier forces are usually thought of in terms of actions at sea, the following results of these sorties may be worth recording: M/T destroyed, 160; damaged, 190. Rail trucks destroyed, 64; damaged, 83. Road cut, 18. Bridges destroyed, 4; damaged, 5. Railways cut, 14. Military installations bombed, 53 direct hits. Ships sunk, 7. In addition, air co-operation in the shape of reconnaissance reports and gunnery spotting was effected on a wide scale. Small wonder that the American General with the landing forces sent the British carriers a message of congratulation in which he cited the co-operation as "a model of perfection." Vice-Admiral Hewitt, U.S. Navy, sent a similar message to Rear-Admiral Troubridge.

A New Spirit

The new Fifth Sea Lord takes up a heavy responsibility. Under the dynamic influence of his predecessor, Vice-Admiral Boyd, a new spirit has been infused in all sections of the naval air arm. Very important internal changes in the Admiralty itself have been effected under the late regime; and in a homely phrase vital ploughing and groundwork preparation for an illustrious future has been done. To Admiral Troubridge come the grave responsibilities of representing air affairs on the Board of Admiralty at a time in aeronautical history when major developments are in train. It is manifest that (1) new weapons will be forthcoming, especially concerning rocket projectile missiles; (2) new and probably much larger aircraft will be needed; and (3) new types of aircraft carriers can be predicted in measurable time. Each of these broad issues carries with it a host of attendant problems, for which the keenest brains and most zealous officers with advanced sea-air ideas and modern war experience will be needed.

Evidence exists that the Navy, having for long been at the receiving end of air power, is not only awakened but mightily aroused as to its new missions. It is, therefore, with confidence and acclaim throughout the Navy that the appointment of Rear Admiral Troubridge has been accepted, since he enjoys that most enviable and rare of qualities—Leadership.

B. J. H.

LANCASTER PARKER'S NEW POST

MR. J. LANKESTER PARKER, O.B.E., F.R.Ae.S., director and chief test pilot of Short Brothers, has resigned his position as chief test pilot and has assumed control of the company's sales department.

Mr. Lankester Parker, who is well known throughout the aeronautical world, has been the firm's chief test pilot since 1916—a unique and wonderful record. He has flown every new product of the company on its initial flight trials—landplanes and seaplanes. The many and varied types of aircraft he has flown range from the tiny Cockle to the mighty Shetland. He will particularly be remembered for his masterly handling of the Short Mayo Composite aircraft during the separation trials, and he was responsible in no small way for the success of the Empire flying boats and the military Sunderlands.

His many friends will wish him well on taking up his new responsibilities.

Mr. Geoffrey A. V. Tyson, A.R.Ae.S., who joined the company in 1940, has been appointed chief test pilot. Previously he held a short-service commission in the Royal Air Force and, on leaving, was appointed flying instructor to the Maidstone Flying Club and then flying instructor to the Scarborough Aero Club. He next joined Sir Alan Cobham's National Air Display as an aerobatic pilot. Many will remember his superb exhibitions of flying, particularly his trick of picking up a handkerchief from the ground with a wing tip and looping under a wire only eighteen feet above the ground. He was next a test pilot at Messrs. A. V. Roe, Ltd., and later rejoined Sir Alan Cobham at Flight Refuelling, Ltd. Mr. Tyson is generally acknowledged to be one of the finest test pilots in the world and is a worthy successor to Mr. Lankester Parker.

AIRCRAFT EXHIBITION IN LONDON

LONDONERS will shortly have the opportunity of seeing an exhibition of modern aircraft, including working models of important equipment. On June 21st there is to be opened on the bombed-out site of John Lewis & Co., Ltd., in Oxford Street, London, an exhibition arranged by the Ministry of Aircraft Production in association with the Ministry of Information.

A number of fighter and bomber aircraft of leading types will be displayed free to the public with the object of showing British workers their contribution to the war effort and how R.A.F. supremacy has been sustained by technical and design progress. We gather the intention originally was to arrange such an exhibition last year, but the spate of V1 and V2 weapons caused a postponement of the plan. That the authorities have decided to hold such an exhibition is very pleasing to us, and we hope it will not be confined to London.

In Paris now there is a small aviation exhibition of French aircraft engines and equipment at the former Renault showrooms in the Champs-Elysées.

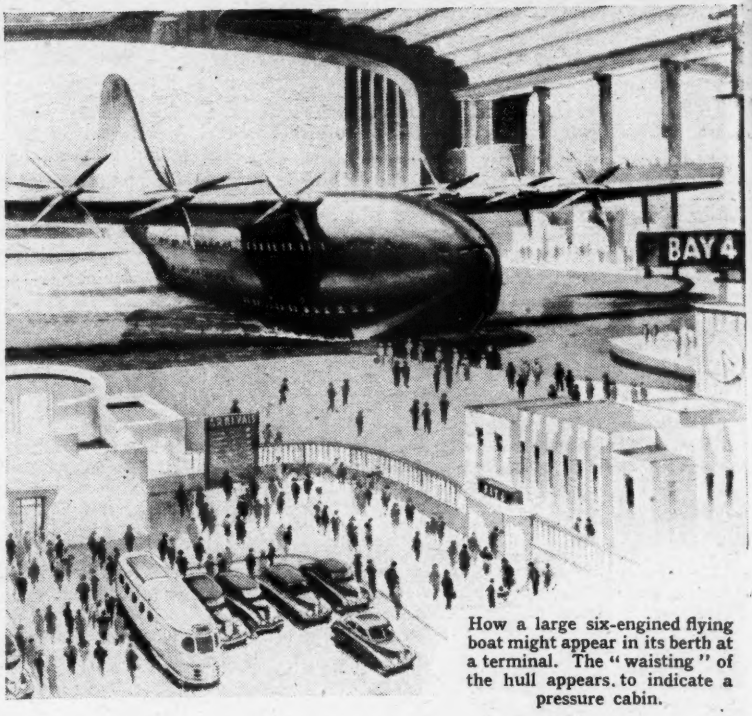
R.O.C. TO STAND DOWN

THE Air Ministry has announced that the stand-down of the Royal Observer Corps will begin simultaneously with the disbandment of the Civil Defence Services on "the appointed day," but it may not be possible for all R.O.C. groups to be stood-down on the same day. The R.O.C. is the chief agency for reporting the identity and movements of aircraft flying near the coast and overland, and is an essential element in the active air defences of the country. Its stand-down, therefore, must be related to adjustments in the defences of Britain.

Flying-Boat Moorings

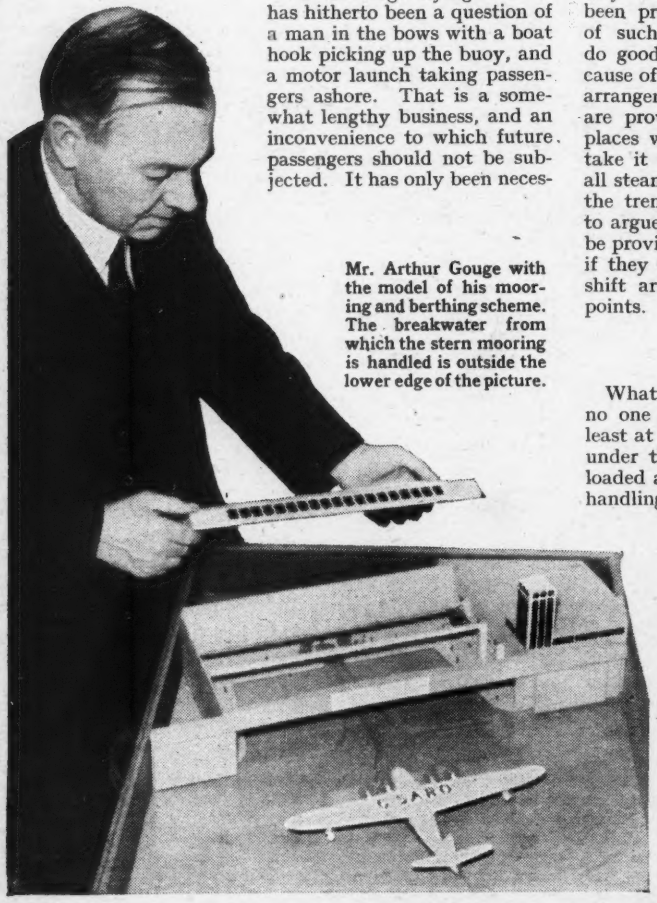
New Saro Scheme Automatic in Action : Berthing Time Reduced to Five Minutes

SINGLE-HANDED picking-up of seaplane moorings is a tricky business. It *can* be done. We have seen it done—by Mr. John Lankester Parker in a Short Mussel float-plane on the Medway. He taxied up to the buoy, throttled back, jumped out on the port float and walked to the bows, and picked up the rubber buoy designed by the late Mr. Eustace Short. But the performance is not one that could by any stretch of the imagination be termed a "commercial" operation.



How a large six-engined flying boat might appear in its berth at a terminal. The "waisting" of the hull appears to indicate a pressure cabin.

In the large flying boat it has hitherto been a question of a man in the bows with a boat hook picking up the buoy, and a motor launch taking passengers ashore. That is a somewhat lengthy business, and an inconvenience to which future passengers should not be subjected. It has only been necessary hitherto because no proper terminal facilities have been provided for flying boats. The fact that in spite of such handicaps the flying boat has been able to do good work year after year appears to have been the cause of the neglect which has been its lot so far as docking arrangements are concerned. Yet steamers of every sort are provided with harbours, except for out-of-the-way places where cargo has to be unloaded into boats which take it to the shore. Can anyone seriously argue that if all steamers had had to do this, shipping would have been the tremendous industry it is? Surely then it is logical to argue that the time has come when flying boats should be provided with terminals at the ends of their routes, even if they can continue to make do with the present make-shift arrangements at intermediate and less important points.



Mr. Arthur Gouge with the model of his mooring and berthing scheme. The breakwater from which the stern mooring is handled is outside the lower edge of the picture.

Roofed Docking

What the flying-boat harbour will look like ultimately no one can foretell accurately, but obviously it will, at least at terminals, have to have a proper terminal building under the roof of which passengers and freight can be loaded and unloaded. That at once raises the problem of handling the flying boat after it has touched-down. Saunders-Roe, Ltd., have evolved a very neat scheme which makes the mooring and berthing operation almost entirely automatic.

The Saro scheme, for which Mr. A. Gouge is largely responsible, is based on the assumption that opposite the hangar into which the flying boat is to be hauled there is a breakwater, parallel with the front of the hangar and facing it. On this breakwater is a line of rails on which runs a trolley. Between the breakwater and the inner wall of the hangar runs an endless cable, the upper run of which is kept floating on or near the surface by small buoys. Spaced some ten feet apart are also a number of stops. Under the bows of the flying boat is a special hook.

After alighting, the pilot taxies the flying boat into position to cross the cable approximately at right angles. As soon as the hook touches the cable

it engages it and the boat is made fast at the bows, the only freedom it has there being governed by the spacing of the stops and, in a strong wind across the cable, perhaps a slight sagging to leeward. A power-operated winch hauls in the cable and with it the boat.

If there is a strong wind across the cable at the time the flying boat is being moored, it will be necessary to have some control over the stern also. The present scheme, which seems capable of improvement, is that a man in a launch should go out from the breakwater and attach the end of a cable to the stern of the hull. The trolley on the breakwater is then used for hauling in the other end of this cable, partly by a winch and also, if necessary, being driven along the rails on the breakwater, thus bringing the hull of the flying boat parallel with the cable to the hangar and at right angles to its front wall. By hauling in on the power winch in the hangar and paying out the cable from the breakwater, the boat can be kept at this angle and berthed without damage.

Bringing the boat into its hangar bows-first has the advantage that the engines can be run inside without causing inconvenience to passengers and personnel on the landward staging of the building, since the slip-streams will blow out through the open doors on the seaward side. For bringing the boat out of the hangar the reverse procedure is followed. The engines can be run-up one after the other and then throttled right down. When all is ready, the boat is hauled out of the hangar by the stern line from the breakwater and, when clear, the crew of the boat can release both bow and stern lines from inside the hull.

The Saro scheme is rather based upon the assumption that the flying-boat terminal is a tideless lagoon, artificially made but in communication with the sea so as to be filled with salt water as some protection against a too-ready formation of ice. This contiguity is in any case desirable from other considerations, such as the availability of a stretch of sea for emergency landings immediately after take-off, should an engine cut or some such mishap befall.

Sunderlands' Daring Flight

FOR the second time in 12 months Sunderland flying boats of a Ceylon-based squadron of a Royal Air Force Indian Ocean general reconnaissance group, under the command of Air Marshal A. Durston, have crossed the high mountains of the Indo-Burma frontier to put down on waterways where no flying boat had ever been before.

Heavy equipment urgently needed in Burma was 1,210 miles away. To get it there quickly it was necessary to use aircraft that could not only carry heavy loads over long distances, but could also put down on the waters of the Chindwin river and thus save valuable loading and reloading time.

The first time Sunderlands made the long journey northwards to take part in operations over Burma was in June last, when they evacuated wounded and sick personnel of the special force "Chindits" from Indawgyi Lake. This second operation was no less hazardous. Again it involved the crossing of high mountain ridges and putting down in unknown waters.

Leaving their Ceylon base, two Sunderlands, skippered by Sqn. Ldr. S. W. Deller and Flt. Lt. C. F. Potter, flew to Bombay, where arrangements were made to ferry the first loads across India to Calcutta. The flights were accomplished without incident, each aircraft carrying goods weighing over 5,000 lb. Next day Sqn. Ldr. Deller, who was in charge of the whole operation, went to Shweggin, on the Chindwin, four miles south of Kalewa, in order to prospect a likely spot for the Sunderlands to put down. He chose a place between steep banks rising to nearly 300ft., and made arrangements for a strip to be marked. This was done by means of mooring yellow-painted oil drums in the water.

Bad-weather Difficulties

Sqn. Ldr. Deller then returned to Calcutta, and three days later his Sunderland started for the Chindwin. "Weather conditions were far from good," said his Canadian co-pilot, Flt. Lt. E. E. Little. "Our maps gave the highest point of the Chin Hills we should cross as 8,600ft., but we flew at 10,700ft. to be on the safe side. Even so we seemed only just to clear some of the tops. Soon we ran into thick cloud—10/10 up to 12,000ft.—and 100 miles short of Kalewa we couldn't see a thing. It was very bumpy. In one place we dropped 800ft. in under five seconds and we just couldn't do a thing about it."

Encouraged by a better weather forecast, the crew made a second attempt two days later. This time there was 10/10 cloud at about 11,000ft., and still the turbulence was grave. "Every member of the crew had to strap himself in," said Sqn. Ldr. Deller, "but we made the Chindwin all right and put down first time. It was a good job we did, as the high banks made it quite impossible for any second attempt."

The cargo was unloaded in quick time, and the Sunderland set out to recross the mountains. "This time we flew at 12,700ft., and as the weather was clear we had a chance of seeing the country," Sqn. Ldr. Deller continued. "It was all jungle and mountain. There was no possible place where we could put down if things went wrong."

The following day Flt. Lt. Potter made his first hop. Weather conditions had improved, and he had a good run out at 12,100ft. The Sunderland remained in the Chindwin for 50 minutes for unloading, and then returned, flying over the mountains at 15,200ft.

By now it was obvious that further aircraft would be necessary if the operation was to be completed in the time allotted, and two other Sunderlands were sent from Ceylon to Bombay to bring other cargoes into Calcutta. Flt. Lt. A. S. Pedley was returning from the fourth sortie to the Chindwin when the two inner engines failed as he was over the Chin Hills at a height of 14,000ft. "We had some anxious moments," he said, "as we began to lose height. Certainly the Burma jungle looked inhospitable enough should we be forced to bale out. However, we got back to Calcutta safely, but were unable to take any further part in the operation."

Five days later Sqn. Ldr. Deller put down on the Chindwin for the third time and brought out men of the 14th Army due for home leave and repatriation. "They were a cheerful crowd," he said, "and didn't worry overmuch about that crossing."

On March 9 the final load was taken. By then the Sunderlands had carried out eight sorties across the Chin Hills and transported 400,000 lb. of material. Sqn. Ldr. Deller himself made four sorties, as well as undertaking much of the organisation. Flt. Lt. R. S. Levy-Haarscher, of Palestine, was the fourth pilot who made the trip.

Only by the use of these flying boats could such supplies have been transported in time to the place where they were needed. The subsequent success of the Irrawaddy crossing owed much to the enterprise and pluck of the Sunderland crews, soaring over country where no flying boat had even been before.

R.A.F. AIR TRANSPORT GROUP

BEST known of all the R.A.F. groups to the fighters of Field Marshal Montgomery's 21 Army Groups, is the 46th, of R.A.F. Air Transport Command.

Formed in February, 1944, under the command of Air Vice-Marshal A. L. Fiddament, D.F.C., it went into action on D-Day, played a spearhead role in the Normandy airborne operation, suffered gallantly and heavily in the Arnhem operation, and now has completed a year of remarkable achievement, acting as a spearhead in the Rhine airborne crossing which planted an arrow in the heart of Germany.

The group has also provided the greatest air ambulance service in the history of British arms. It has flown back to Britain nearly 70,000 wounded, and has flown 22,000 wounded from forward to rear areas on the Continent.

A senior officer at an airfield, the nerve centre of all the ramifications of the group, told a P.A. reporter: "That service has saved a great many lives, and as a result of it a great number of men still have the limbs and eyes they would otherwise have lost. And not a single casualty case has been injured in the whole of the flying operations."

In one case a soldier severely wounded in the head on the Continent in the morning was being operated on in an Oxford hospital in the afternoon.

The group moved into Brussels as the Germans moved out, and in a month their Brussels staging-post handled 3,438 aircraft from Britain, over 7,000 tons of freight and 4,280 passengers, and evacuated 7,200 casualties to England, all without mishap.

"Indicator" Discusses Topics of the Day

Getting Over the "Hump"

The Paramount Importance of the Experimental Test Pilot's Work : Advanced Technical and Theoretical Knowledge as a Necessity Rather than an Asset : The Scientific Pilot as the Key Man of the Immediate Future

SINCE it is obviously impossible to make every designer into a test pilot, then we must try our best to make every test pilot into a designer. The time has certainly come when the amount of very real technical knowledge required by the experimental test pilot is immense, and very soon this knowledge will have to be supplemented by an even greater amount of modern aerodynamic theory. The design of aircraft intended to fly at super-sonic or near-sonic speeds is such that progress will be ultimately possible only through the exertions of the test pilots, and their work will tend to be partly wasted if they themselves cannot put their fingers on the causes of various phenomena encountered.

There has been, and will in future be, the occasional prodigy who is equally at home in the air or behind the water-cooled slide-rule, and the test pilot of to-day is infinitely more knowledgeable in matters of aerodynamic theory than was his forerunner of a decade ago, but something a great deal more than casually obtained knowledge and experience will be needed during the coming decade if we are to mount the next step of flying progress. It would be too much to expect the man who has the kind of imaginative intelligence and training needed for the design of a modern aircraft to be necessarily capable of flying the thing as well. Apart from the fact that it is unusual for the clever mathematician or "inventor" to be temperamentally suited to the job of flying a prototype, he might have poor eyesight or be incapable, by age or for other reasons, of the co-ordinated dexterity required even for the casual driving of an ordinary machine. It would be more than stupid if the best designers were to be shelved simply because their reactions or nervous systems were unsuited to the business of carrying out straightforward diving tests, or a general handling routine on a new type.

Technical Test Pilots

The whole thing must obviously be developed from the other end, and the existing test pilots, and those who are on the way towards becoming test pilots, must be given the opportunity of taking a much more considerable interest in present-day aerodynamic theory. The rule-of-thumb knowledge which is, at present, such an excellent foil to the sometimes self-satisfied prognostications of the design staff, will not be enough in the future. Not only must the test pilot be capable of speaking the designer's own language, but he must be capable of absolute and final decisions in consultation with the design staff—for he will be the only person to know what is happening to the airflow, and to be really capable of translating the practical effects into necessary alterations. It will not be enough for him to offer an accurate second-by-second account of the aircraft's behaviour—and certainly not to bring back a mere cinematographic, or load-graph record of this behaviour. Such a record can so easily be, and is, in fact, so often, misconstrued by technicians with their own patent theories and their own fixed ideas of aerofoil behaviour. Such theories and ideas must be leavened before reissue in the form of modifications—and the leavening agent will obviously be the highly-technical test pilot.

Aerodynamic theory has always been a step behind the actual observed results. So much so that the cynically minded pilot can be forgiven for suggesting that aircraft design is still very much a rule-of-thumb affair. Just when, with the help of practical results, a wing-section or aileron system has been perfected, the need arises for further development to deal with greater speeds or loadings, and the same process of trial and error must be repeated. The test pilot brings back his figures and the designer cannot understand them. Only after the same figures have been brought back for a second or third time does the designer—who has only his theoretical knowledge and previous precedents on which to work—begin to wonder whether his initial assumptions were correct. He is doing his best with the experience and information available, and flight tests are so often disproving of the previously obtained results

Local Compressibility

With very modern aircraft the divergence of fact and expectation can be easily understood. Though the aircraft itself may not be flying at a speed within a century or so of compressibility, there may be small areas where the airflow velocity is nearing the speed of sound and so entirely upsetting the characteristics, for instance, of a control surface. It is often very much simpler than that. Not so long ago the immediate development of one of our outstanding prototypes was held up simply because of an inexplicable and apparently incurable bout of tail-buffeting. A similar layout, with much less clean cowlings and centre-section, had given no previous cause for complaint, and the prototype had almost been given up when somebody—probably the drawing-office blue-print boy—pointed out that, for one reason or another, the lip of an air intake (shall we say) had had its shape changed in the course of development from the previous design. The shape of this intake, with no great faith in it as a likely cause, was altered. No further trouble was experienced. Again, one of the better-known pre-war American transports was designed with a high-lift type of flap so that the take-off run could be shortened. But the take-off flap setting could, in fact, never be used because the down-wash, bouncing back off the runway, upset the fore and aft trim. And even the full-down limit setting was reduced later because of violent trim-changing when full power was used after a baulked approach.

The reasons for such comparatively simple effects can easily be worked out by the design staff when the facts are given in the form of a pilot's report, but something a great deal more explicit and basic than a mere statement of successive facts will be necessary when every prototype is designed to fly at a speed which, at high altitudes and low temperatures, is dangerously near that of sound. Furthermore, the period during which strange phenomena in control and trim reactions can be allowed to continue must be very short, and all possible information must be garnered, if possible, in one flight and without the necessity of carrying a load of irreplaceable technicians. In any case, these technicians will not be in the best position to judge control forces, instabilities, and trim changes. Only the pilot himself can provide the essential information which, coupled with the various graphs drawn by sundry G-meters, accelerometers, stick-force meters, and altitude recorders, will offer the data necessary for successful modification. In the case of single-seat fighters, of course, it will not even be possible to carry either observers or a great deal of recording gear, and most of the story must be obtained from the pilot's own reasoning during the few seconds in which the Mach number is very

GETTING OVER THE HUMP

high—before denser and warmer air is met during the dive, and normal or near-normal control returns.

For the youngish test pilot who is prepared to be, at the same time, an expert in aerodynamics and stressing, the next ten years will be very interesting indeed. He may sometimes feel rather like a guinea pig, but if he has sufficient knowledge—and confidence in that knowledge—there is no reason why he should often be frightened, or even much surprised, when queer things begin to happen. He himself will have been able to predict the "queerities" with fair accuracy, and, because his trained mind will jump to the possible causes, other unexpected happenings should not take him off his guard. Although knowledge—or the knowledge of one's lack of knowledge in the matter of supersonic effects may make some pilots less happy at test work than they were when they floundered in comparative ignorance, the majority of those who have an inbred liking for such experiences will be all the more efficient. They will be better off, at least, than the unknown pilot who first encountered trouble at high speeds and high altitude. This unfortunate probably didn't know why the tail buffeted, or why the nose could no longer be held up. He may even have tried to bale out, or wound his trimmer tabs fully down in his effort to hold the nose up, so that, at a lower level and when the elevators started to bite again, the wings came smartly away at a loading of 12 G or so. If my imaginary pioneer had known what it was all about, he would, at the best, not have suffered such a severe fright!

Certainly, I feel that if we are to make really rapid progress over the compressibility "hump," the experimental test pilot of the immediate future will need to be hardly less knowledgeable than, and as powerful as, the chief designer. And he will need to be even more of a key man than he is at present. The future of flying is virtually in his hands and brain. "INDICATOR."

RUHR TOUR

A Desert of Dust and Rubble : 540 Square Miles of Devastation

(From Our War Correspondent)

I HAVE just returned from an aerial tour of inspection of bomb damage in the Ruhr. The Dakota in which I travelled covered more than 150 miles and flew over most of the 14 principal towns which go to make up what is known as the Ruhr, including Düsseldorf and the other manufacturing centres in the Wupper valley. There is a general impression that the Ruhr is a continuous built-up area, rather like one big sprawling city, but that is quite wrong. It covers in all roughly 1,000 square miles and has a peacetime population of just over four million people. Compare this with London's 640 square miles and 8,000,000 people, and the density of industrial and residential built-up area in the Ruhr becomes apparent.

This relatively thin covering over a large area has made Bomber Command's task doubly difficult, but it has been achieved in a most complete and thorough manner. Of all the built-up areas in the Ruhr, no less than 54 per cent. (or all the buildings in 540 square miles of ground) is *completely* devastated. The word "devastated" is used here as an exact term and not as loosely referring to any bombed area.

Flying over London, or any other bombed city in Britain, one has to search for the damage, which always appears insignificant from the air. Over the Ruhr one has to search much harder to find just one building intact. In some areas the damage is incredible, amounting locally to as much as 93.7 per cent.

When starting on this tour it was my original intention to look carefully at certain factories and towns, especially those which had figured so much in the news throughout the war. Almost from the beginning, however, after passing the Siegfreid Line defences and flying over Krefeld, a kind of mental numbness is experienced. One smashed factory looks just like another smashed factory. One town reduced to rubble looks like any other town reduced to rubble. It is all a desert of rust and rubble with just a tiny wisp of smoke or steam here and there, where a pathetic attempt is being made to get a little power going for electricity, water and suchlike. Everywhere the whole ground sparkles where myriads of pieces of broken glass reflect the sun's rays upwards. Only an occasional person is to be seen walking through this wilderness, and one wonders how life has carried on at all under such conditions. I am told that in the farmhouses in the surrounding districts as many as nine and ten people are living in each room.

All through the area can be seen the now empty A.A. gun positions. At one time there were about 2,000 of these. By the number of craters surrounding them, it is easy to understand why the ground defences sometimes fizzled out during a saturation raid. In many of the factories are the typical conical sugar-loaf air-raid shelters. These appear to have stood the racket very well. With all the factory chimneys cold, and a brilliant sun shining on a spring day, the visibility was excellent. How different it must have been for our aircrews, before instrument bombing reached its present stage of perfection, to search through the moonlit industrial haze for some small factory on the outskirts of a town.

The concentration of the bombing is really remarkable in the target areas. This does not mean that none have fallen in the fields. Thousands of them have, but only in those close by the target areas. There is nothing comparable with the South of England at the time of the 1940-41 blitz, when bomb craters could be found in many fields miles away from anything which even the easy-minded *Luftwaffe* could call a target.

Right from the beginning Bomber Command set out to smash the Ruhr. If that great Command had done nothing else at all, its existence would have been justified. The Ruhr produced 71 per cent. of the enemy's coking coal and 61.5 per cent. of his total supply of pig iron and steel. In the area there are 42 collieries, 10 synthetic oil plants and 22 marshalling yards. These marshalling yards were, at their peak, able to handle up to 80,000 trucks per day. The individual factories are innumerable and include, of course, Krupps of Essen and Rheinmetall Borsig of Düsseldorf, which are the two largest engineering and armament works in Europe. Krupps (two miles long by one mile wide) is now a monument in red rust and debris to the R.A.F.'s operational efficiency.

Apart from America's share, the Royal Air Force made 51,000 sorties and dropped altogether 182,000 tons of bombs—an average of 3.56 tons per aircraft. It is not permissible to give exact percentages of losses sustained, but taking 1942 as a basis (when area-bombing and big incendiary raids started) casualties were down by one-half in 1943, to one-quarter in 1944 and to one-seventh in 1945.

It was largely the urgent necessity of putting the Ruhr industries out of action which gave the great urge to improve our bomb-aiming technique. In the early raids our aircrews ranged over the Ruhr searching visually for their targets, a most harassing business and unsatisfactory in result. Then came the G. box, which made area bombing and saturation raids possible. Decoy fires and such devices lost their effectiveness. Finally came the pathfinder and master-bomber technique, in which coloured target-indicator flares are dropped from Mosquitoes with specially trained crews flying in flak-free air above the bombers. It is somewhat of a revelation to know that the most accurate bombing of all is now by instrument. As to the efficacy of the new technique, there is no doubt.

The first Battle of the Ruhr began on the night of March 5th, 1943—when the first really heavy damage was done to Krupps and Essen—and reached its height in May and June of that year. Return attacks were made at intervals to destroy what had been repaired, until the autumn of 1944, when the second Battle of the Ruhr started. This second battle opened with a very heavy attack on Dortmund on October 6th, and continued with raids on all the main industrial and railway centres from then onwards. With the Allied armies fighting within a few miles of the Ruhr this second battle became in effect tactical. The vast network of communications was of the greatest use to the German army.

Eventually the Ruhr was occupied by the Americans by brilliant encirclement and compression. That, however, was a land battle for an area. The other battle—the battle to stop the Ruhr as a vast war-production centre—had already been won absolutely and completely by air bombardment.

J. Y.

Cargo Aircraft

A Study of the Efficiencies of Various Designs : Greatest Economy When Wing Loadings Range from 20 to 26 Pounds per Square Foot and Power Loadings from 15 to 11.5 Pounds per Horsepower

By ROBERT J. NEBESAR

AS it is always possible to achieve great speeds for a given price with sacrifice in economy (this, however, not being the best solution to the problem), a study has been prepared on the air cargo transportation economics as affected by speed increases resulting from higher wing loadings and lower power loadings.

It is recognised that, in passenger transportation, the passenger could, and probably would, pay premium prices for time saved due to higher speeds. This will not be the case in cargo and freight transportation. It is not believed that a customer would want to pay the cost of, say, 30 per cent. higher operational expenses for saving 45 min. time on a 5-hr. total time ; that is, flying plus handling, on a 500-mile trip ; or, say for 3 hr. saving on 15 hr. total time necessary for a 2,000-mile trip.

In cargo and freight transportation, the service of picking up and delivery of the goods by truck must also be taken into account This will further extend the time required for such service, and will therefore reduce the advantage of higher speeds obtained in the air.

For these reasons, it is believed that the advantages of air cargo transportation, as compared with ground transportation, will not be great enough to operate at distances much shorter than 500 miles. For example, for a distance of 150 miles, approximately 4 hr. will be required for truck service, this including pick-up and delivery. For an aircraft, $\frac{3}{4}$ hr. will be required for flying, and approximately 2 hr. ground handling time, this including the time required for pick-up and transfer of cargo between the service truck and aircraft at point of departure, and unloading and delivery time at the point of destination. Therefore, the time required for aircraft service will be $2+\frac{3}{4}$, totalling $2\frac{3}{4}$ hr. The difference between the two means of transportation would be only $1\frac{1}{4}$ hr. For twice the distance, the time required would still be only overnight travel of a truck, so that delivery of the goods by either method of transportation could be made early in the morning. It is therefore only at distances approximating 500 miles that a substantial portion of a working day would be saved by aircraft.

As is seen from the above figures, the handling time is a very important factor in aircraft cargo transportation, and every effort must be made to facilitate this. A typical example of such excellent arrangement is a railroad box car. Its floor is level and located at the most convenient height above the ground. Its capacity and size should also be taken into consideration in the design of a cargo aircraft, but not necessarily its height.

Basic Design Features

In order to satisfy these requirements, the logical cargo aircraft therefore would be : High wing so that there is easy access to the fuselage and its cargo hold. Tricycle landing gear must be used so that the fuselage floor is level and of approximate height of a truck platform for easy loading. The door opening, which would best be located in the rear, should be approximately 9ft. wide and 7ft. high ; and the length of the cargo hold, which must be unobstructed, should be anywhere from 30ft. to 60ft., depending on the size of the aircraft. For handling mail, compartments accessible from the outside should be placed under the main cargo floor, with possibly some arrangement for the use of parachute containers for mail in localities where the aircraft would not land.

The design should be such that the distribution of cargo or freight in the cargo hold would allow great variation so that the airlines would not have to go through any lengthy centre of gravity computations. For example, it is quite feasible to provide variation of C.G. limits of such magnitude that either the forward or aft half of the cargo

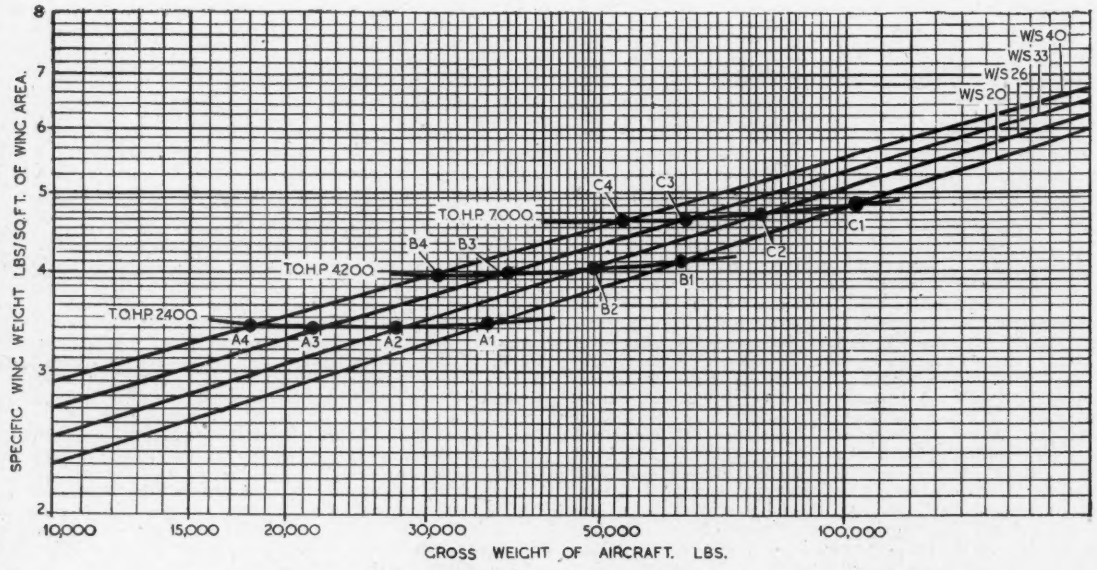


Fig. 1. Variation of specific wing structure weight with gross weight and wing loading.

THE author of this paper, which was read before the National Air Cargo Meeting of the Society of Automotive Engineers at Chicago, began his career as an aircraft designer in his native Czechoslovakia. He is now vice-president and chief engineer of Universal Moulded Products Corporation, of Bristol, Virginia.

In the paper Mr. Nebesar makes an extensive study of the efficiencies of cargo aircraft design, and examines several designs for three different engine sizes and four different wing loadings. As a primary take-off requirement he uses Dr. E. P. Warner's formula, which specifies that the product of wing loading and power loading should equal 300. This is assumed for normal gross weight. For overload conditions a 20 per cent. overload is used. This brings the product of wing and power loadings to 432, which, the author considers, should still give a fair take-off performance on existing A-class airports.

hold could be loaded 50 per cent. more than the other half. This would do away with lots of grief for the operators and would shorten the handling time considerably.

With these basic design features in mind, the basic parameters such as power loading and wing loading will now be investigated. For obvious reasons of simplicity and economy, it is believed that a twin-engine aircraft will be satisfactory for cargo operations for quite some time yet.

Three different engine sizes have been selected, such as 1,200 take-off horse-power as the smallest engine to be used, 2,100 take-off horse-power as the medium size, and 3,500 take-off horse-power as the biggest engine. The pertaining Meto horse-power of these engines will be 1,050 h.p. for the smallest, 1,800 h.p. for the medium, and 3,050 h.p. for the largest one. Around these engines, that is, around each of the above particular sizes, aircraft of different sizes and gross weights could be designed.

Four sizes have been selected, that is, four different gross weights for each engine size and range from power loadings of 15 lb./T.O. h.p. to 7½ lb./T.O. h.p., the intermediate power loadings being 11.5 and 9.1.

The different designs are listed in the weight analysis—Table I, where, in line 6 the corresponding gross weights are given. For the lowest power loading, the gross weight will be only one-half of the gross weight of the aircraft, with the power loading as analysed. We have now twelve aircraft of designations, as given in line 1 of Table I, ranging from 18,000 lb. to 105,000 lb. gross weight.

In order to satisfy the present take-off requirements and to have all these designs on the same basis in this respect, a formula proposed by Hon. E. P. Warner is used stating that the product of wing and power loadings should equal 300. This requirement gives us the wing loadings of 20 lb./sq. ft., corresponding to 15 lb./T.O. h.p., and 40 lb./sq. ft. which corresponds to a 7.5 lb. power loading with the intermediate wing loadings being 26 and 33, as given in line 3 of Table I. The pertaining wing areas are given in line 4.

A twin-engined aircraft representative aspect ratio of 8.5, which determines the span values given in line 5, is assumed. The plan view taper ratio is assumed 3: 1 and frontal view taper ratio 6: 1.

Weight group statements established from different projects in a standard manner except for the pertaining notations are given in lines 7 to 13. Due to great variations of fuel tankage required, the weights of fuel tanks were included in the useful loads given in lines 18 and 19.

Specific Wing Weights

The wing weights as given in line 9 are established from Fig. 1. This figure gives values of specific wing weights (in pounds per square foot of wing area) for different wing loadings and different gross weights, and were estimated partly from wing weights of actual aircraft, and partly from different projects. Since design speeds and, therefore, load factors will increase with increasing wing loadings (these corresponding to decreasing power loadings), it is evident that the specific wing weights for higher wing loadings will be greater. Of course, the specific wing weights will also

TABLE I.—WEIGHT ANALYSIS

		2x 1,050 Meto H.P. Engines, 2,400 T. O. H. P.				2x 1,800 Meto H.P. Engines, 4,200 T. O. H. P.				2x 3,050 Meto H.P. Engines, 7,000 T. O. H. P.			
1	Airplane designation	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2	Power loading W/T.O. h.p.	15	11.5	9.1	7.5	15	11.5	9.1	7.5	15	11.5	9.1	7.5
3	Wing loading W/S	20	26	33	40	20	26	33	40	20	26	33	40
4	Wing area, sq. ft.	1,800	1,060	660	450	3,150	1,860	1,158	788	5,250	3,090	1,930	1,313
5	Span, ft. A.R. 8½	123.5	95	75	61:8	163.5	125.5	99	81.7	211	162	128	105.5
6	Gross weight, lb.	36,000	27,600	21,800	18,000	63,000	48,300	38,200	31,500	105,000	80,500	63,700	52,500
7	Power plant weight (including gas and oil installation, but excluding gas tanks), lb.*	4,700	4,500	4,400	4.300	8,800	8,500	8,200	8,000	14,400	14,000	13,700	13,500
8	Nacelles (50 per cent. of weight assumed constant, remainder varying with wing chord), lb.	580	510	450	410	1,930	1,670	1,500	1,370	4,550	3,950	3,500	3,200
9	Wing weight (from Fig. 2), lb.	6,250	3,600	2,230	1,520	12,900	7,520	4,630	3,150	24,900	14,500	9,000	6,150
10	Tail surfaces (15 per cent. of wing weight), lb.	940	540	335	228	1,935	1,130	695	470	3,750	2,175	1,350	925
11	Body group (60 per cent. of weight assumed constant, remainder varying with wing chord), lb.	2,350	2,100	1,900	1,750	4,500	4,000	3,600	3,300	8,050	7,200	6,500	6,000
12	Landing gear (6.8 per cent. of gross weight), lb.	2,450	1,880	1,480	1,220	4,280	3,280	2,600	2,140	7,150	5,480	4,330	3,570
13	Fixed equipment (difference only in de-icers, hydraulics and controls), lb.**	2,900	2,250	2,100	2,050	4,400	3,600	3,000	2,800	6,700	5,000	4,600	3,850
14	Empty weight (excluding gas tanks), lb.	20,170	15,380	12,895	11,478	38,745	29,700	24,225	21,230	69,500	52,305	42,980	37,195
15	Ratio $\frac{\text{Weight empty}}{\text{Gross weight}}$ per cent.	56.0	55,7	59.1	63.7	61.5	61.5	63.4	67.4	66.2	65.0	67.5	70.9
16	Ratio $\frac{\text{Power plant weight}}{\text{Weight empty}}$ per cent.	23.3	29.2	33.8	37.4	22.7	28.6	33.8	37.6	20.7	26 8	31.9	36.3
17	Ratio $\frac{\text{Useful load}}{\text{Gross weight}}$ per cent.	44.0	44.3	40.9	36,3	38.5	38.5	36.6	32.6	33.8	35.0	32.5	29.2
18	Useful load (including gas tanks), lb.	15,830	12,220	8,905	6,522	24,255	18,600	13,975	10,270	35,500	28,195	20,720	15,305
19	Useful load at 20 per cent. overload, lb.	23,030	17,740	13,265	10,122	36,855	28,260	21,615	16,570	56,500	44,295	33,460	25,805

* Deduction made for smaller diameter propellers.
** Furnishings assumed 800 lb. for A group, 1,400 lb. for B, 2,000 lb. for C.

CARGO AIRCRAFT

increase with the size of the aircraft as given by its gross weight.

It should be noted that there is not much variation of the specific wing weights of different aircraft pertaining to the same engine sizes. The effect of increasing sizes are outbalanced by the effect of increasing wing loadings.

The weights of body groups, that is, of fuselages and booms, are given in line 11. Since the rear portion of the fuselage with pertaining fairings and booms carrying tail surfaces will be to a great extent designed by the adjoining wing, their weight will vary with wing chord and therefore only about 60 per cent. of these group weights are conservatively assumed as constant. The fuselage cargo hold length is assumed to be 30ft. for Group A aircraft, 43ft. for Group B, and 60ft. for Group C for identical frontal areas of 9ft. by 7ft. as mentioned above.

These dimensions of cargo holds correspond to the loads of 7, 10 and 14 tons to be carried, assuming the cargo density of approximately 7.5 lb./cu. ft.

The cargo load of 7 tons could possibly be realised as overload for some of the A aircraft group in short range operations. Ten tons could possibly be carried by Group B at medium range operations, while 14 tons could be carried by most of the Group C aircraft for long-range operations, especially at the overload condition. From line 19, it should be noted that all the aircraft of low wing loadings (20 to 26 lb./sq. ft.) could easily satisfy the above load-carrying requirement, while the ones with higher wing loadings would have to carry less.

The resulting empty weights are given in line 14 and the ratios of empty weight/gross weight in line 15. Their ascending tendency for wing loads above 26 lb./sq. ft. should be noted not only as far as the wing loading is being increased, but also as the gross weight increases.

In line 16, the ratio of power plant weight/weight empty is tabulated, showing substantial increases with the decreasing power loadings, which explains a good portion of the ascending tendency of empty to gross weight ratios as mentioned above.

Useful loads as figured in line 18 of Table I, which include weights of gasoline tanks, are plotted against gross weights in Fig. 2.

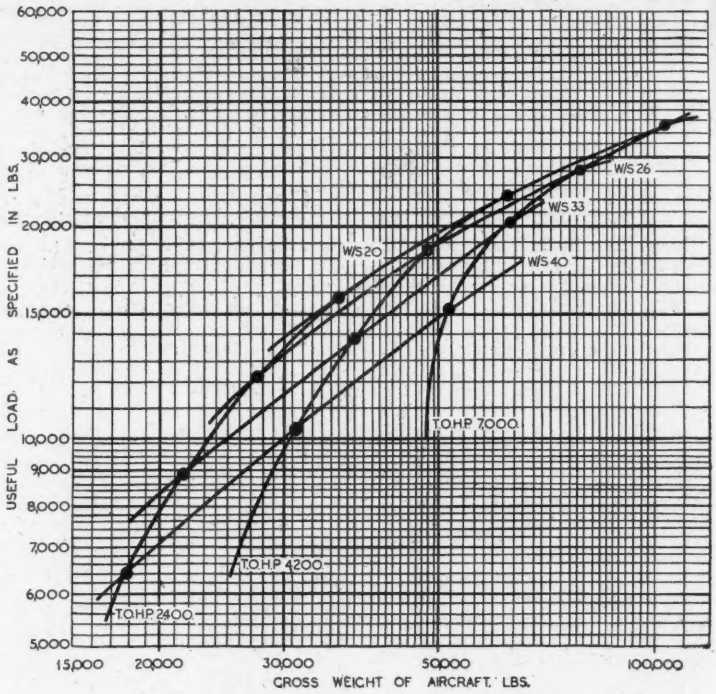


Fig. 2. Useful loads decrease rapidly with increased wing loading, and useful load/gross weight ratio decreases with size.

Useful Load and Wing Loading

It should be noted that the useful loads of aircraft with low wing loadings, such as 20 lb./sq. ft., are much higher than those with high wing loadings. The useful loads of aircraft A1 of 36,000 lb. gross weight with 1,200 h.p. engines is still about the same as that of aircraft C4 of 52,500 lb. gross weight with 3,500 h.p. engines. The useful loads decrease rapidly with increasing wing loadings. They also increase with the size, as would be expected. However, the percentage of useful load to gross weight steadily decreases with increasing size, except for 26 lb./sq. ft. wing loading, as mentioned above.

While for aircraft such as A and B groups with smaller engines, the ratio of useful load to gross weight as given in line 17 steadily decreases with increasing wing loads except for wing loadings of 20 to 26 lb./sq. ft. in the biggest category, the aircraft C2 with 26 lb./sq. ft. wing loading is from this standpoint more efficient than the aircraft C1 with 20 lb./sq. ft. wing loading. However, the useful load of the C1 aircraft is still much higher and will be proven somewhat more efficient for cargo operations later.

The following are the assumptions for drag and lift computations. The wing profile drag coefficients are assumed as those of the tapered N.A.C.A. 23018-09 airfoil as given in N.A.C.A. Technical Report No. 627, Fig. 12. The induced drag co-efficients are determined for all cases with an aspect ratio of 8.5.

The different parasite drag coefficients are assumed as follows:—

$$\text{Fuselage} = C_{D_f} = 0.105.$$

The maximum frontal area of the fuselage is assumed to be 70 sq. ft. for all groups. The drag of pilots' cockpit is included in the above coefficient.

$$\text{Engine nacelles} = C_{D_n} = 0.120.$$

This is assumed to account also for tail surface booms which merge into the nacelles and wing. The total frontal area for both nacelles is assumed as 39.4 sq. ft. for all groups.

$$\text{Tail surfaces} = C_{D_t} = 0.011.$$

The total area of the tail surfaces is assumed to be 30 per cent. of that of the corresponding wing.

All the parasite drag coefficients are assumed to be constant for a small range of speeds in the proximity of cruising speeds.

(*To be continued next week.*)

THE YALTA AIR DISASTER

A FULL and frank explanation of the loss of the York aircraft carrying Government officials to the Yalta conference was given by the Air Minister, Sir Archibald Sinclair, in Parliament last week.

He said that the party was to have been taken in a Liberator, but one of its engines developed a fault just before the time to take off, and as the trouble could not quickly be remedied they changed over to the York, which was the only other long-range aircraft immediately available. The York's crew, though experienced individually, had never previously flown together, but the occasion was urgent and the weather forecast good. Near Naples the weather broke and the pilot decided to go on to Malta, but owing to radio distortion there was an error in navigation and they arrived over Lampadusa. After circling for an hour in darkness the pilot obtained a correct bearing, but then had insufficient fuel to reach Malta, 85 miles away, and the aircraft was brought down on the sea. Soon after alighting it broke up.

Only Angels May Fly

U.S. Civil Air Regulations that "Handcuff" the Private Pilot

By N. D. RYDER

THOSE of us in Britain who are inclined to complain that our more or less benevolent Government has taken far too long to realise that aviation means something, may console ourselves with the reflection that there are compensations in this—especially for the private pilot.

Anyone who doubts this statement should study the Civil Air Regulations of the U.S.A. where, most Englishmen fondly imagine, everyone can do what he jolly well pleases, even though "Prohibition" is no more.

For in that land of the free, it seems, the private pilot is so hedged about with queer regulations that one would imagine the authorities wanted to discourage him from ever leaving the ground. This will come as a surprise, or even as a shock, to many of us who have long been encouraged in the belief that in America, before the war, light aircraft were "thicker than fleas on a dog's back" compared with the grasshopper density of this country. But I have it on the authority of the American journal, *Air News*, which recently published an article setting forth some of these restrictive regulations and sharply criticising the Civil Aeronautics Board for that section of their book-of-words aimed at the "elimination of undesirable flying practices."

"This," says the journal, "is the curiously unfunny joker which has brought the most peculiar regulations in the American lawbooks. Some of these regulations may have saved a few lives, but it is a known fact that no law has ever been written which would save a grandstander from his own misadventures. But attempts to achieve this goal have handcuffed *every* airman in this country for eighteen years." The American pilot, it seems, is faced by "an almost insurmountable obstacle of restrictions which actually discourages all but the fanatics."

Most of these restrictions, if not all of them, have no doubt been imposed from the best of motives; nobody suggests for a single moment that those who framed them had any objective other than to make flying as safe as possible. But some are too sweeping, some are out of date and need drastic revision, and others are so queer that it is difficult to guess just what particular aspect of safety the framers originally had in mind; maybe they have even forgotten themselves by now!

Too Sweeping

Take, for example, the one which prohibits the operation of a landplane at less than 500ft. above water, and amphibians at less than 300ft. This was introduced because in the late "twenties" there were some very young men who liked to give themselves and the crowd a thrill by diving under bridges, or took a sadistic delight in "beating-up" a crowded holiday beach. Of course it was patently necessary to discourage this sort of perilous amusement, but the resultant regulation makes it illegal for the level-headed owner of a Piper Cub to hop across a small bay or estuary without first wasting time and juice in climbing above the minimum height. It prevents the pilot of a small seaplane from coming down close enough to, say, a lake, to see if there is room to land for a spot of fishing. Of course, nobody normally flies at less than 500ft., but the point is there are many occasions when, for some specific reason, a private pilot may wish to do so without in any way being guilty of "undesirable flying practices." And needless to say, the odd clown still occasionally writes himself off against a concrete breakwater, in spite of this form of hari-kari being strictly illegal.

As an example of the out-of-date regulation in need of some modification, the article points out that although the helicopter has more or less arrived, it is still illegal to operate an aircraft at less than 1,000ft. above a city or congested area, so it would be quite illegal to land one's helicopter in the back garden or on the office roof—assuming you have that sort of roof. Similarly, the same regulation rather cuts across American plans to establish airparks in the middle of some of their cities unless the said airparks are to be built on 1,000ft. stilts.

At the other end of the scale, the 1926 rule forbidding the operation of any but military or experimental aircraft at altitudes exceeding 17,000ft. is still in force. In 1926, 17,000ft. was quite a ceiling, but to-day it is a very moderate height for commercial operation though it hardly concerns the owner-pilot of a 60 h.p. grasshopper.

Defeating Their Purpose

That regulations can sometimes defeat the very purpose they are meant to serve is illustrated by one concerning parachutes. As everyone knows, a parachute needs inspecting and repacking at not too wide intervals if it is to be 100 per cent. dependable. Whether there had been cases of 'chutes failing to open in circumstances which suggested some sort of neglect I cannot say, but C.A.B. made it unlawful for any civil aircraft to carry a parachute for emergency use unless that parachute had, within the preceding 60 days, been packed by a person certified for that purpose in accordance with C.A.R. The result of this regulation is that few private owners have, in the past, provided themselves with a parachute at all, because they did not want to be saddled with the compulsory expense and trouble of frequent repacking. One can easily see the force of this regulation where the fare-paying air passenger is concerned, but the law does not compel the private pilot to carry a parachute. Yet if he elects to do so he immediately comes under one more regulation, with the inevitable risk of being penalised for infringing it. Thus he is discouraged from carrying a parachute even though he may fully appreciate the well-known fact that if he ever needs it, he will need it badly, and so would not be likely to neglect its proper care. In any case, many a life has been saved by an old 'chute that fortunately did its job though nobody could remember the last time it had been repacked—which makes any parachute, say 65 days away from the rigging shop, better than nothing in an emergency.

As for regulations coming under the heading of "queer," it is laid down, for example, that no student pilot can apply for a private pilot's certificate unless he can speak English. But for some curious reason citizens of Puerto Rico are exempt from this ruling, so we shall probably find veterans of the Polish Air Force taking the easier way out, after the war, by becoming legal citizens of that favoured locality.

Queerest of all, however, must surely be the regulation which stipulates that the applicant for a pilot's certificate must be "of good moral character."—Shades of the Pilgrim Fathers!! One is tempted to wonder if this apparently irrelevant stipulation was inspired by the morbid expectation of the applicant's soon having to face the Great Examiner. As *Air News* itself indicates, it's a good job for the automobile industry that the same requirement does not apply to drivers' licences!

And so, on the principle that it is always a comfort to see somebody worse off than oneself, British pilots may feel consoled; at least they don't have to get their applications for an "A" licence backed by the local vicar, who, by the way, is often himself referred to as a "sky-pilot."

CIVIL AVIATION NEWS

CO-OP.

A PLAN for the promotion of a co-operative civil air transport enterprise designed to give employment to considerable numbers of R C.A.F. personnel and to serve a number of Canadian communities has been discussed with the Canadian Government.

Capt. W. D. Cabell, spokesman for a committee organising the venture, has been in touch with several Government departments and says 220 communities have been approached.

It is proposed to operate under a federal charter with a capital of $4,200,000; financing is to be provided by the service personnel who would take part in the venture and appropriate contributions from communities which are to be served.

It is expected that equipment, including aircraft, may be obtained from surplus Government stores through War Assets Corporation when they become available.

Apart from this and the granting of licences for such air services as are proposed, it is understood the plan calls for little Government assistance.

COLOMBIAN DEVELOPMENT

CONSTRUCTION of a commercial airport in Santa Marta, capital of the department of Magdelena, Colombia was authorised some time ago by the Government. The new airport will be designed to permit the operation of heavy transport aircraft which serve the Caribbean area and whose international routes follow the coast.

In Eastern Colombia which was always without regular means of communication, improved air transport facilities have been arranged by the *Aerovias Nacionales de Colombia*.

A new Colombian company, the *Mundos Aerovias, S.A.*, with headquarters in Cali, department of Valle del Cauca, is to operate a freight and passenger service in the south-western section of the country, connecting all large gold mining properties in that area.

TRIPPE'S TIPS

MR. JUAN TRIPPE, president of Pan American Airways System, largest U.S. international airline in operation before the war, endorsed the "basic philosophy" of a Bill to set up a single U.S. community airline in international operations after the war, in testimony before the Senate Sub-Committee on Aviation.

Mr. Trippe cited estimates showing that but 9 per cent. of the total airline traffic before the war was carried overseas, and forecasts that by 1950 the total airline international traffic would be not more than 18 per cent. of the total of all traffic. To divide overseas traffic between several airlines, Mr. Trippe said, would weaken the U.S. competitive position against single-company foreign airlines.

Mr. Trippe estimated that of the total overseas airline operations about 60 per cent. would be over the North Atlantic, with the rest between Latin-America and the Pacific. He said that a fleet of eleven aircraft of a size recently ordered by Pan American, with passenger accommodations ranging between 100 and 200 passengers, could carry 440,000 passengers across the Atlantic in one year.

INTERNAL SERVICES

THE summer time-tables of the Railway Associated Air Companies indicate gradual improvements in wartime internal air services.

Railway Air Services, Ltd., announce a service which will operate in each direction on week-days between London (Croydon) and Prestwick. As already reported, it is intended primarily for Transatlantic passengers arriving at or leaving from Prestwick.

The London-Liverpool service, which has been in operation since November last, has been retimed and now leaves Croydon at 9.15 a.m., due Liverpool 10.55 a.m. The return service leaves Liverpool at 3.15 p.m. and is due Croydon at 4.55 p.m. Air passengers to and from Belfast, Isle of Man and Dublin connect with the London service at Liverpool.

The services between Liverpool and Belfast have been increased to four in each direction, and between Glasgow and Belfast to three in each direction each week-day.

Scottish Airways.—Apart from the London-Prestwick service which is operated by Railway Air Services, Ltd., in collaboration with Scottish Airways, the summer time-table of Scottish Airways announces the introduction of a direct service between Glasgow and Stornoway thrice weekly in each direction. The journey takes two hours.

The service between Inverness and Stornoway, which operated during the summer of last year, is reinstated with a thrice-weekly service in each direction. The regular routes from Renfrew to Campbelltown and Islay and to and from Tiree, Benbecula, North Uist and Stornoway are still in operation.

Although travel restrictions to and from Eire limit the demand, West Coast Air Services, Ltd., in conjunction with the Irish Air Lines, are maintaining two services each week-day between Liverpool and Dublin, the air journey being made in one hour twenty minutes.

Isle of Man Air Services.—The frequencies of the service between Liverpool and the Isle of Man have now been increased to four in each direction every week-day. Flying time is one hour by this service, which has proved to be one of the most popular air lines in the country.

The services between Penzance and Scilly Isles continue to be operated by Great Western and Southern Air Lines.

SERVICE IN SWEDEN: The B.O.A.C. has just opened an information office in Stockholm to give advice and guidance on air transport.

NORTH ATLANTIC

THE end of April has seen the completion of 1,500 flights on the North Atlantic Return Ferry service operated by British Overseas Airways Corporation. This service has the unique operational record of several winters.

Since B.O.A.C. became responsible for the two-way Atlantic service on September 24th, 1941, it has maintained a schedule of regular crossings throughout the summer and winter in both directions between Prestwick and Montreal. It now operates a daily service in each direction except that there is at the moment no west-bound flight on Mondays and no east-bound service on Sundays. It is likely, however, that the schedules will be stepped-up to one daily in the near future.

The route from Prestwick is usually direct to Gander, Newfoundland, a distance of approximately 2,800 miles. Should headwinds be exceptionally strong the route may be via Iceland, or farther north to Goose in Labrador. From either Goose or Gander the services run straight to Dorval, Montreal. An alternative to these routes is via the Azores. The 3,150 miles from Prestwick to Montreal and vice versa are frequently flown non-stop.

CIVIL AVIATION NEWS

U.S.–SPAIN TRIAL

A TRIAL flight, heralding the first U.S.-Spain airline service, will be held next month, according to information from Madrid.

This is stated to have been decided at a meeting of the U.S. Export Commission and Spanish experts.

INTER-ISLAND TRAFFIC

THE British West Indian Airways have recently received three aircraft from Canada and have thus been able to improve their service to Barbados. The company is reported to be planning an extension of operations to other islands.

AUSTRALIAN NETWORK

AUSTRALIAN civil airlines, serving 74 cities and towns, flew a total of 10,614,250 passenger and transport hours in 1944.

The lines carried 244,839 passengers, over 1,729 tons of freight and more than 1,831 tons of mail.

In addition to internal flights, thrice-weekly services were operated by Qantas between Australia and Ceylon on the British England-Australia route.

SOLD

A TOTAL of 44 DC-3s have been sold by the U.S. Surplus Board to foreign companies. Of European operators Sweden bought five, France five, K.L.M. four, S.A.B.E.N.A., Iberia of Spain and Turkish Airways and the Royal Norwegian Air Transport three each.

Lockheed Lodestars were sold to the Canadian Pacific Airlines, Lebanon, the Linea Aeropostal Venezolana (three each) and two to the *Navegacao Aereo Inter-Americano* of Cuba.

CUBA REORGANISES

CONTROL of civil aviation formerly exercised by the Army has been transferred to a National Transportation Commission. Proposals are now being worked out for the establishment of an independent civil aviation authority.

Another Government decree declared all privately owned and operated airports in Cuba open to public against payment of fees to be established by the Government.

The *Compañia Cubana de Aviacion* has been awarded a new five-year internal air-mail contract and is to start a night service between Habana and Santiago de Cuba.

VALUE OF SURPLUS

THE rate of utilisation of aircraft engaged in American civil transport is still going up. According to the U.S. Air Transport Association, last autumn it was at 12½ hours and 1,910 miles per day per aircraft, while to-day it is about 13½ hours and slightly over 2,000 miles per day.

Based on this rate of utilisation, it is estimated that the 82 transport machines turned over to airlines by the Surplus Board will add another 60,000,000 aircraft miles annually to the total of American internal and foreign services.

BRISTOL SETS AN EXAMPLE

CIVIL air transport was the subject at a public meeting organised by the Bristol Chamber of Commerce at Bristol last week. The Lord Mayor, Mr. W. F. Cottrell, opened the meeting, at which eight mayors of West-of-England towns were present. The speakers were Lord Brabazon of Tara, Mr. Peter Masefield, and Capt. A. G. Lamplugh.

Lord Brabazon stressed the importance of "showing the flag" in the air. Aircraft would be the yardstick by which foreigners judged our technical efficiency. They would be pieces of England that went out to represent us. Bristol must be a centre, not merely an import port but also an export port. Perhaps London would have to be the main terminus for the transatlantic air route to America, but there was no reason that because there is a Paddington there should not also be a Temple Meads.

Mr. Masefield referred to the great technical strides made during the war, and expressed the opinion that air fares would be about 2½d. per passenger air mile, compared with the present first-class railway fare of 3d. per mile.

Capt. Lamplugh referred to the need for co-operation by municipalities. On the insurance side he pointed out that the transatlantic insurance rate for air passengers was now about one-fiftieth of the rate that obtained ten years ago.

Col. Whitwell, president of the Bristol Chamber of Commerce, said preliminary meetings had already been held with local authorities in Somerset, Gloucestershire and Wiltshire. We understand that an air committee is to be formed for the purpose of pressing the claims of the West Country.

ADVANCE PARTY

THE first Lancastrian on a development flight for the London-New Zealand service shortly to be opened arrived in Auckland in 53 hr. 13 min. flying time from England, a distance of 13,380 statute miles.

This is the first of five Lancastrians ordered by Qantas Airways for a regular service, and it left this country on April 23rd, touching down at Auckland at 05.20 hr. on the 27th.

The second aircraft left U.K. on April 24th.

It is hoped that the service, which will bring New Zealand within about 86 hr. of London, might start early in June, but this would depend on deliveries of aircraft.

As a preliminary, aircraft will fly straight through, changing crews at Karachi, where Qantas take over. As aircraft and crews become more available, B.O.A.C. and Qantas will operate parallel services.

CEYLON PLANS

THE Ceylon Board of Ministers have decided that the operation of any air service in the island after the war should be handled by the Government. The decision followed a discussion on a memorandum presented by the Minister of Communications and Works, Mr. J. L. Kotalawala, in which he suggested that the Government of Ceylon should take a financial interest in the formation of a corporation, and that until operational experience was gained the corporation should link up with an established air line under a partnership agreement.

It was suggested that 40 per cent. of the required capital should be provided by the Ceylon Government, 30 per cent. by the B.O.A.C. and 30 per cent. by the Ceylon public.

A short while ago a new company known as the Ceylon Airways, Ltd., has been formed by local business interests for the purpose of establishing air services between the island and India and feeder services.

SCOTTISH PLANS

"NO single organisation, no one group of established companies is big enough to handle post-war air commerce on behalf of the 50,000,000 people of the United Kingdom," says a statement by Scottish Aviation, owners of Prestwick airport, in their proposed new schedules of services.

The ambitious and intensive programme of services on internal, European and trans-Atlantic routes which the company desires to operate introduces two novel features. First, an announcement of the company says that it wants no subsidy. "It wants neither monopoly nor quasi-judicial 'protection,' and hopes, indeed, to have regulated competition from other British airlines on every route which it proposes to operate." Secondly, passenger rates are based on third-class surface fares and are in the neighbourhood of 2½d. a mile for all internal and overseas services.

In consequence a glance at the list of proposed fares makes one feel like packing up one's kit and going places. A single fare from Prestwick to Moscow, for instance, is quoted at £17, to New York £40, to Amsterdam £4 17s.

The airlines services which Scottish Aviation propose to fly in the immediate post-war period provide for regular day and night service between Prestwick and North America, six internal routes with frequent daily schedules from Prestwick, Grangemouth or Edinburgh to London, Paris, and the principal cities of the U.K.

The frequency of proposed services between Scottish airports is designed to permit business men in Central Scotland to deal with the morning mail at their offices and reach the capital before lunch time. Three flights daily each way are proposed between Scotland and Paris, two flights daily each way to Oslo, Hamburg, Stockholm and Amsterdam, and once weekly from Prestwick to Copenhagen, Vienna, Belgrade, Prague, Moscow, Marseilles, Rome, and Athens.

The Far East service Prestwick-Vladivostok via Athens, Cairo, Jerusalem and India, a total distance of about 10,700 miles, would leave Prestwick on a Monday at 9 a.m., arriving early next morning in Cairo and Thursday in Vladivostok.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

JET PROPULSION

An Appreciation and a Suggestion

I HAVE been a reader of *Flight* for many years and have read with great interest the many articles on jet propulsion and the difficulties connected with them. I would like to offer you my congratulations on the vindication of your faith in the "squirts." It is a great pity that you were a "voice crying in the wilderness" as far as jet propulsion was concerned.

Seeing the pictures of the Gloster E28/39 and the Bell XP59A makes me look back and delve in the old copies of *Flight* to see what I could find out. I am afraid I must smile at some of the weird and wonderful contraptions which were to be the aircraft of the future, but you did come very near to the truth. I hope you can look into the future again and say what the aircraft of 1950 will be like.

L. CULLINAN.

A CIVIL POWER PLANT

Design Staffs Should Also Fly

IN reference to Mr. Pollitt's letter in *Flight*, January 25th, and having only just reached this country, I wonder if he has considered the practical side of his idea. For instance, it is presumed from his description that he is referring to an engine similar to a Merlin, and if that is correct, how does he contemplate renewing the inlet sparking plugs without first removing the engine? In case he has not witnessed a fitter attending to the plugs on a Merlin, I would like to inform him that the usual practice is for the airman to sit on the engine, which would be impossible if it were slung directly under a wing. No suggestions for removable panels in the wing can be put forward because the depth of the wing would prohibit anyone seeing the plugs, let alone removing them.

In case Mr. Pollitt might think that I am just another "driver, airframe," knowing nothing about the technical side of aircraft, I have been flying for nine years with nearly 2,000 hours to my credit, and am also an ex-student of the D.H. Technical School. It is my candid opinion after flying many types of aircraft that the reason why so many punk machines are produced is because the personnel holding executive positions on the design staffs of most of the large aircraft companies, not only do not fly their companies' products, but haven't even got a pilot's "A" licence and would not fly even if they had the chance. If companies insisted on their design staff holding current "A" licences, I am certain that the number of unnecessary modifications that have to be incorporated at a later date would be drastically reduced.

Although plenty of people are only too pleased to say how good an aircraft is, I think it about time that criticism of existing aircraft was encouraged so that the same mistakes will not be incorporated in later machines.

I wonder if Mr. Pollitt is another of these theoretical men?

(India Command.) TEST PILOT.

SAFETY FUELS

Their Importance in Civil Flying

AS the author of the article in question on "Safety Fuel" (*Flight*, February 1st), I was naturally extremely interested to read "Badra's" formidable reply with its very impressive array of statistics (*Flight*, April 5th).

Although I remain unconvinced, I do wholeheartedly agree with the statement that the subject should now be a "public issue" and, as such, I am entirely unmoved by any considerations of delicacy; it is the public who are going to pay to be burned, though fortunately, as "Badra" points out, a small proportion of them.

However, I shall not cavil at "Badra's" alteration in nomenclature, but I do find it difficult to understand why, although he admits that "thousands of casualties" could have been avoided if such a fuel had been used in military aircraft, he should deny the passenger in civil aircraft the same advantages.

It is difficult to interpret "Badra's" remarks concerning initial boiling points. The brief table of fuel data which he quotes from my article, as specifically pointed out, is laboratory data only, the figures relating to tests carried out under specified conditions. Vapour is naturally evolved at much lower temperatures than the 40 degrees C. quoted and more rapidly according to the surface area exposed. At atmospheric pressures the relative rates of vapour evolution are dependent on initial boiling points and are reflected in their flash points as determined in standard laboratory apparatus. This factor also governs the chances of ignition by a random spark.

The complete theoretical investigation of the relative safety risks of the two types of fuel is virtually impossible and a practical demonstration highly dangerous; surely this is a case for common sense. No one was being "clever" when the name of "Safety fuels" was chosen to cover fluids having these properties; it was merely the realisation that the vapour evolution and flash-point characteristics of such fuels made them inherently less inflammable under certain conditions. It is worthy of note that the carriage under normal circumstances in public transport of fluids having flash points below 73 degrees F. is governed by special conditions.

The extremely satisfactory state of affairs shown by the analysis of accidents in the U.S.A. must be very gratifying to all concerned, but statistics of this nature are little consolation to the unfortunates who happen to be involved in the column headed "Fatalities."

Recently we have had a practical demonstration of the outcry raised by the loss of many highly placed members of the community which caused Sir Archibald Sinclair to produce just such an array of impressive figures covering the operation of R.A.F. Transport Command. I am quite sure that, even though their accident rate is minute, considering the millions of miles safely covered and passengers safely carried, and in spite of operational demands introducing factors which would never have been tolerated by a civil airline, any remedy which could be applied to prevent their recurrence would be or has been adopted.

Surely "Badra" will concede that when 1,000 or more, and not 194, aircraft are involved, there will be yearly a small percentage which may "force land" and catch fire in the same way as military aircraft.

If "Badra" is convinced that "thousands" of military lives could have been saved, then the attitude he has adopted—that under civil airline conditions the amount of people who are going to burn is too small to justify the change—is completely unmoral.

Again, what are we going to lose apart from initial cost? From my experience during a period when I was personally concerned in the development of aviation fuels from the engine side, I believe it is true to say that the use of safety, or relatively safe, fuels will not involve any sensible loss of efficiency, but little development work has been done.

Perhaps, however, some member of the potential producing companies could give his views on this side of the subject.

C. D. SOLTZ.

ENGINE DESIGN

Advantages of Rotating Sleeve Valves

I HAVE always been taught, in the sphere of engine design, that rotation is to be preferred to reciprocation, i.e., that if the reciprocating weights of such auxiliaries as valves can be kept down by using, say, an overhead camshaft, then improved performance will result.

Application of this theory to engines of the Bristol sleeve-valve type have made me wonder why the somewhat unorthodox half-reciprocating and half-rotary valve motion was chosen. To my mind a completely rotating sleeve would be a more sound proposition. Each sleeve would have a bevel-geared ring machined on its base, the drive being made by meshing to a common geared ring coupled to the crankshaft, if necessary, through an epicyclic train. Inlet and exhaust ports, of course, would have to be at two different levels on the sleeve for obvious reasons.

Sufficient port areas could be made by employing a redesigned piston with a high crown and a low "top land," thus giving a good length of sleeve above piston travel in which to machine the ports. The somewhat attenuated combustion chamber resulting from this may at first appear inefficient, but I am of the opinion that controlled turbulence and inclined manifolds would make this a negligible objection. A further advantage would be that the overall cylinder height would be reduced and thus allow a smaller diameter radial

engine to be produced—important in times when frontal area is such a limiting factor.

Other technical problems such as lubrication, heat distribution, gas seals, etc., have already been overcome and would hardly vary in this proposed layout. While I can hardly conceive that the engine manufacturers did not give this principle their full consideration, I wonder if any reader can explain why its theoretical advantages were outweighed in favour of the existing type of sleeve-valve. STUDENT.

THE PRICE PAID
United We Conquer

"IT is . . . hoped that the R.A.F. will never . . . be told to manage as best they can for a year on a wretched sixteen million pounds, while the Royal Navy is allowed to spend eight million pounds on a single battleship which a few Lancasters, with 22,000 lb. bombs on board, could blow straight out of the water even more easily than they turned the *Tirpitz* over with 12,000 lb. bombs."—(*Flight*, "The Outlook," April 12th, 1945.)

That the above statement could appear in 1945 in one of the most widely read aeronautical journals in the world fills me with grave concern for the future. The aircraft versus battleship controversy has waged fiercely throughout this war, the protagonists of the aircraft's star reaching its height after the loss of the *Prince of Wales* and the *Repulse*, whilst that of the advocates of the ship rose equally high when the *Scharnhorst*, *Gneisenau* and *Prinz Eugen* made their epic dash through the Channel after months of concentrated and, we were assured, fatal bombing in Brest, and later when an American battleship shot down all of the 39 bombers and torpedo bombers attacking her without hurt to herself.

What has prevented the German Fleet making a nuisance of itself on our convoy routes? Not any threat from the air, but the knowledge or fear that our convoys would be heavily escorted by units of the Royal Navy, or that to reach convoys farther afield they would have to run the gauntlet of heavy naval units. Would the *Scharnhorst* and her sister have attempted their Channel dash if they had suspected the presence of British battleships in the Channel? I doubt it.

Ask anyone who was there whether Malta could have been sustained in the dark days of 1941 and 1942 in the face of a German-manned battle fleet. The answer will be "No," and yet, as the world knows, Malta was maintained—albeit at great cost—by the Royal and Merchant Navies in the face of overwhelming Axis air superiority.

But why go on? Convincing arguments can be produced by both sides, and the only possible answer is that neither the sea, nor the air, nor indeed the land, alone can win wars or stave off defeat. All are interdependent.

That is why it pains me to read the statement reproduced above. I heartily endorse your plea for a "living wage" for the R.A.F., but this must be obtained in co-operation with, and not in competition with, the other Services. It would have been a little better—not much—if a convincing and true argument had been used, but to say "a few Lancasters" reminds one of the scaremongers just before the last war who said that the advent of the submarine had rendered the capital ship useless and those who said, not so many years ago, that the development of air power had made invasion impracticable. How wrong they have been proved! It would be interesting to know just how much the *Tirpitz* cost the British nation. If some mathematician could work out the cost of the R.A.F.—and the so-often-forgotten Fleet Air Arm—aircraft which attacked her during her few years of life, the cost of the reconnaissance so vitally necessary to keep her under observation, the cost of the naval escorts required to guard our Russian convoy route for just so long as this monster was in being, and the cost of locking up much of our naval strength in Home waters, and if the answer could then be sent to Berchtesgaden I fancy the German High Command would think that their investment in the *Tirpitz* had paid a high rate of interest. And how much more might it not have paid had she been boldly and resolutely handled? So much for the "few Lancasters."

All praise to the magnificent work of the R.A.F., but let us have less of this one-sided writing, which can do irreparable harm. I look forward to the day when the Minister for Air stands up in the House to support the First Lord's contention that we must lay down "X" more battleships in the coming year and equally so the First Lord being quite emphatic that the Air Minister's demand for new and better bombers is vital for the nation's defence. Then, and only then, will we be able to say we have truly learned the greatest lesson of World War II—"United we conquer; divided we fall."

"N.O."

[Our correspondent appears to misinterpret our comment. There is no suggestion that the Navy is no longer wanted. We do maintain, however, that there may no longer be a place for the huge and expensive capital ships now that the really big bomb has come to stay. At present we are the only nation in the world to have this bomb—and presumably we have not yet reached finality—but it is reasonable to suppose that other countries will quickly follow suit. Long before the 25 years' life of a modern battleship has expired, shall we not see at least 20-ton bombs being dropped accurately by instrument from aircraft flying at great heights and great speeds?

Could we have held Malta if the Germans or Italians had had 12,000 lb. or 22,000 lb. bombs to drop in Valetta harbour?

Did the R.A.F. not sink the *Tirpitz*, *Von Scheer* and *Luetzow* as soon as the big bomb was available?

The *Scharnhorst*, *Gneisenau* and *Prinz Eugen* incident in the Channel is best forgotten. The attack by the Fleet Air Arm reached great heights of bravery and devotion to duty, but had we then possessed the large bombs and the operating technique, the incident might have ended differently. Let us face this fact: a ten-ton bomb exploding 60 or 70 ft. below the bottom of any ship in the world to-day will either blow the bottom in or turn the ship over.—ED.]

BOOK REVIEWS

R.A.F., Middle East. Prepared by the Ministry of Information for the Air Ministry. Sold by H.M. Stationery Office. 1s. 9d. net.

THIS brochure gives the official story of air operations in the Middle East from February, 1942, to January, 1943. The tale ends with the occupation of Tripoli.

The writer is handicapped by having to close when the story is not all told; for though during the advance into Tunisia the air contingents of the R.A.F. Middle East Command became merged in the larger forces of which General Eisenhower was the Supreme Commander, the operations in northern Africa were all one. To stop at Tripoli leaves the reader like a hungry man who has enjoyed his joint and now wants his pudding.

Another handicap from which the writer suffered was the difficulty of disentangling the air operations from what was essentially a combined effort by all three Services; but it must be admitted that he has overcome this difficulty with considerable success. He has told just sufficient of the naval and military sides of the campaign to explain how needful it was to have an air side as well. He has emphasised the necessity of holding and supplying Malta; and he has stressed that the effort to achieve that object was largely a matter of securing enough airfields.

On the other hand, this account does not say enough about the evolution of the Tactical Air Force. Perhaps it was not his job to explain how the lessons learnt in Africa have since been applied in north-western Europe; but still the reader is left with a feeling of a gap. The future historian of the war must deal with all three Services together. This war does not lend itself to sectional treatment—except for such matters as the Battle of Britain and the bombing offensive.

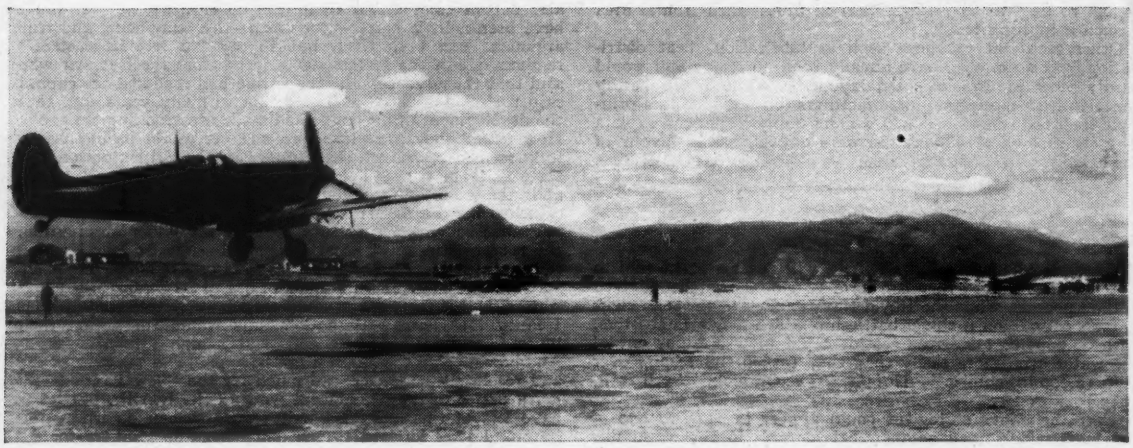
On the whole, this brochure strikes us as somewhat less interesting than most of the previous official publications; but certainly the account of Alamein is stirringly told.

Freedom from War. By Air Vice-Marshal Donald Bennett. Pilot Press. 3s. 6d. net.

WE are all of us fed up with war—especially those who have gone through two world wars in their lifetime. Nobody is more sick of the business than the fighting men. Gone are the days when Sir Walter Scott could make Douglas exclaim:—

"The chase I follow far.
'Tis mimicry of noble war."

So Air Vice-Marshal Bennett (Bennett of the "Pathfinders") has set his ingenious brain to work to find some cast-iron plan for avoiding wars in the future. What it boils down to is a reformed League of Nations backed by an International Law Force. The latter must consist of all Services and arms, and must be manned by personnel drawn from all the nations. It must replace all national forces other than civil police and it must use a common language. After going into some details, the author asserts: "It cannot fail." He has not considered savage warfare, such as raids by warlike tribesmen on the frontiers of more civilised countries in Asia and Africa. But any plan which puts a stop to world wars by nations able to use science (as, for example, V-bombs) would be of the greatest benefit to mankind.



R.A.F. RETURNS : A Spitfire coming in to land on the island of Crete where bases have been re-established. About 10,000 Germans are still holding out in the north-western area.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations :—

Distinguished Service Order

Wing Cdr. C. F. C. WRIGHT, D.F.C., R.A.F.O., No. 547 Sqn.—This officer has completed much operational flying and throughout has displayed high qualities of skill and devotion to duty. Before joining his present squadron Wing Cdr. Wright participated in several attacks on enemy shipping and harbour installations. During these operations at least eight vessels were sunk and others were damaged. Much of the success achieved can be attributed to Wing Cdr. Wright's skilful leadership. Recently this officer flew with great distinction in an attack on enemy shipping in Baltic waters. Wing Cdr. Wright has invariably displayed a high degree of courage and resolution and set an example which has impressed all.

Act. Wing Cdr. F. D. HUGHES, D.F.C., R.A.F.V.R., No. 604 Sqn.—Wing Cdr. Hughes has displayed the highest standard of devotion to duty throughout a long period of operational flying. His outstanding keenness, great skill and unsurpassed determination have been well reflected in the success of the squadron which, under his brilliant leadership, has been responsible for the destruction of a good number of enemy aircraft. Among his own personal successes, Wing Cdr. Hughes has destroyed 18 enemy aircraft.

Lt. Col. J. M. FAURE, D.F.C., S.A.A.F.—This officer has completed numerous sorties on his third tour of operational duty. In these operations he has led large formations of aircraft in attacks against a variety of targets. Much of the success achieved can be attributed to this officer's outstanding ability, personal courage and unswerving devotion to duty. In addition to his gallant work in the air, Lt. Col. Faure has shown a high standard of organising ability and great drive, qualities which have contributed materially to the efficiency of the formations he commands.

Act. Flt. Lt. M. G. BACHE, R.A.A.F., No. 467 (R.A.A.F.) Sqn.—This officer has completed many operational missions and has displayed high qualities of skill, courage and determination. In January, 1945, Flt. Lt. Bache piloted an aircraft in an attack against the Dortmund-Ems Canal. When nearing the target the aircraft was hit in one of the wings and in the bomb bay by shrapnel. In spite of this, Flt. Lt. Bache went on to execute a good bombing run. Shortly afterwards the aircraft was again hit. The port inner engine caught fire and the propeller had to be feathered. The port outer engine also was damaged. One of the petrol tanks was punctured and its contents drained away. Other damage which affected the control of the aircraft was also sustained. Height was lost rapidly and Flt. Lt. Bache experienced the greatest difficulty in retaining control. Nevertheless, he was determined, if possible, to reach the Allied lines. To ease the strain of flying with full rudder applied, Flt. Lt. Bache instructed another member of the crew to fasten a cable to the rudder pedal. The damaged port engine now failed completely. Still this resolute pilot held on. As he passed over the Rhine defences at a low altitude his aircraft came under considerable light anti-aircraft fire and was hit in many places. Nevertheless, Flt. Lt. Bache reached the Allied lines before ordering his crew to abandon aircraft. Not until they were clear did he himself jump. He was then so low that, as he got clear of the crashing aircraft he struck the top of a tree almost as his parachute opened. This officer displayed exemplary conduct in the face of great danger, and the ultimate safety of his crew was undoubtedly due to his skill, bravery and resolution.

Act. Wing Cdr. D. L. CARTRIDGE, D.F.C., R.A.F.O., No. 254 Sqn.—Within recent months this officer has participated in numerous attacks on enemy shipping and throughout has set a fine example of gallantry and devotion to duty. In January, 1945, he led a force of aircraft in an attack on shipping in the harbour at Den Helder. Intense anti-aircraft fire was encountered and several aircraft were hit. Nevertheless, the attack was pressed home, with good results. Much of the success obtained can be attributed to Wing Cdr. Cartridge's skilful leadership. This officer has displayed outstanding keenness, and his determination to obtain the best results has won great praise.

Flt. Lt. B. C. DAYMOND, D.F.C., R.A.A.F., No. 240 Sqn.—Within a short period this officer has completed several operational flights, necessitating the highest standard of skill, perseverance and resource. That success was achieved in each case is a splendid tribute to Flt. Lt. Daymond's outstanding ability, great daring and resolution. He set an example of the highest order.

Act. Wing Cdr., J. E. DENNANT, D.F.C., R.A.F.O., No. 109 Sqn.—This officer's operational record is outstanding. He has completed more than a hundred missions, many of which have been against heavily defended targets in Germany. Throughout, he has set an example of a very high order. Undeterred by the heaviest of anti-aircraft fire or fighter interference, Wing Cdr. Dennant has always pressed home his attacks with the greatest resolution. In December, 1944, he piloted an aircraft in an attack on Dusseldorf. At the commencement of the bombing run his aircraft came under fire from the anti-aircraft batteries and was hit. Shortly afterwards it was illuminated in a cone of searchlights. Nevertheless, Wing Cdr. Dennant pressed home his attack. His bombing run was perfect. This officer has shown outstanding skill, great bravery and unswerving devotion to duty. In addition to his work in the air, Wing Cdr. Dennant has displayed a high standard of organising ability and great drive and his services have been of immense value.

Act. Sqn. Ldr P. F. CLAYTON, D.F.C R.A.F.V.R., No. 156 Sqn.—This officer has completed a very large number of sorties, involving attacks on a wide range of well-defended targets. He has displayed exceptional skill and throughout his devotion to duty has been unfailing. One night in January, 1945, Sqn. Ldr. Clayton took part in an attack on Magdeburg. In spite of considerable fire from the ground defences, Sqn. Ldr. Clayton pressed home his attack with great skill. His determination to obtain the best results on this occasion was typical of that which he has shown throughout his tour of operational duty. His splendid example has earned him the respect of the whole squadron.

Bar to Distinguished Flying Cross

Act. Wing Cdr. M. E. PICKFORD, D.F.C., R.A.F., No. 149 Sqn.—In November, 1944, this officer was pilot and captain in an aircraft detailed to attack Homberg. When nearing the target the aircraft was badly hit. Half the starboard elevator was smashed. The nose rose sharply and the aircraft started to climb steeply. Nevertheless, Wing Cdr. Pickford regained control. Despite extreme difficulty in maintaining level flight, this resolute pilot completed a good bombing run and afterwards flew the damaged aircraft to base, where he effected a safe landing. His superb skill was undoubtedly largely responsible for the safe return of the aircraft.

Flt. Lt. D. C. BUNCH, D.F.C., R.A.F.V.R., No. 157 Sqn.—Flt. Lt. Bunch has completed a very large number of sorties and continues to render most

Badge of No. 600 (City of London) Squadron, A.A.F. "Praeter Sescentos." (More than Six Hundred.)

Badge of No. 69 Squadron, R.A.F. "With Vigilance we Serve."

SERVICE AVIATION

valuable service. He is a highly skilled member of aircraft crew and has assisted in the destruction of seven enemy aircraft. He has at all times displayed a high standard of determination and devotion to duty.

Flt. Lt. J. O. MATHEWS, D.F.C., R.A.F.V.R., and W/O. A. PENROSE, D.F.C., R.A.F.V.R., both of No. 157 Sqn.

As pilot and observer respectively this officer and warrant officer have participated in very many sorties, and continue to display great enthusiasm for air operations. They are highly skilled members of aircraft crew and have shown the greatest keenness to engage the enemy. They have destroyed seven enemy aircraft, two of them in one sortie in December, 1944.

Act. Flt. Lt. W. M. STRATHERN, D.F.C., R.N.Z.A.F., No. 138 Sqn.—This officer was the captain of an aircraft detailed for an operational sortie one night in December, 1944. For his crew, this was their first sortie. Dring the operation the aircraft was attacked by a fighter, from which a burst of machine-gun fire caused much damage. The rear gunner was badly wounded and his gun turret was rendered unserviceable. The port elevator was shot away and the fuselage was hit by bullets in many places. Flt. Lt. Strathern, from his position in the second pilot's seat, immediately took control. By skilful manœuvring, he succeeded in finally evading the attacker. The starboard inner engine was now out of action and the aircraft had become exceedingly difficult to control. Nevertheless, by a superb display of airmanship, Flt. Lt. Strathern flew the badly damaged aircraft back to base. In most harassing circumstances this officer displayed outstanding coolness, great courage and model captaincy.

F/O. J. S. V. MCALLISTER, D.F.C., D.F.M., R.A.F.V.R., and F/O. A. J. OWEN, D.F.C., D.F.M., R.A.F.V.R., both of No. 85 Sqn.

These officers have displayed the highest standard of courage and resolution in air operations. They have completed a large number of sorties, during which they have destroyed 15 enemy aircraft, successes which well illustrate their exceptional skill. Fearless and devoted members of aircraft crew, these officers have set an example of a high order.

Flt. Lt. A. D. BEATY, D.F.C., R.A.F.V.R., No. 206 Sqn.—One night in February, 1945, this officer piloted an aircraft in an attack on an enemy naval vessel in Baltic waters. In spite of intense and accurate anti-aircraft fire, Flt. Lt. Beaty pressed home his attack with the greatest resolution. His aircraft was hit and sustained serious damage. All rudder controls were shot away. One engine was so badly hit that the propeller had to be feathered. The port aileron was damaged and one of the wings and part of the fuselage were holed. Although the aircraft was very difficult to control, Flt. Lt. Beaty flew it a considerable distance to an airfield, where he effected a safe landing. This officer displayed superb skill, great courage and determination throughout this notable sortie.

Flt. Lt. R. J. AUDET, D.F.C., R.C.A.F., No. 411 (R.C.A.F.) Sqn. This officer is an outstanding fighter. Since his first engagement, towards the end of December, 1944, he has completed numerous sorties during which he has destroyed a further six enemy aircraft, bringing his total victories to eleven. Flt. Lt. Audet has also most effectively attacked numerous locomotives and mechanical vehicles. His skill and daring have won the greatest praise.

Act. Sqn. Ldr. C. T. P. STEPHENSON, D.F.C., R.A.F., No. 266 Sqn.—In February, 1945, the squadron was detailed to execute a low level photographic reconnaissance covering a three-mile stretch of the Rhine, commencing at Emmerich. Here, the area is very strongly defended. It was this part of the area which Sqn. Ldr. Stephenson chose to reconnoitre himself. With great daring he made his run down the centre of the river past Emmerich at a very low level. Throughout the entire run his aircraft was a target for intense and continuous fire from enemy guns on both sides of the river. Nevertheless, Sqn. Ldr. Stephenson executed his task successfully. Such was his determination that at one point he flew under eight high-tension cables so that no part of the river bank thereabouts should be missed by his camera. The results obtained are a splendid tribute to this officer's great skill and bravery.

F/O. J. CASTAGNOLA, D.F.C., R.A.F.V.R., No. 617 Sqn.—As captain of aircraft this officer has completed a large number of sorties and throughout has displayed the greatest keenness. He has invariably pressed home his attacks with skill and resolution and his successes have been well proved by the good photographs he has secured. F/O. Castagnola took part in the final attack on the German battleship *Tirpitz;* he also flew with distinction in an attack against the Kembs Barrage. During a daylight attack against shipping in Bergen this pilot obtained a hit on a merchantman. After releasing his bombs, F/O. Castagnola saw an enemy fighter engaging a badly damaged bomber from his own squadron. He promptly manœuvred into a position where his gunners could engage the enemy aircraft, which was driven off by their accurate fire. This officer has not once failed to complete his allotted task.

Flt. Lt. E. R. HEDGECOE, D.F.C., R.A.F.V.R.—Since the award of the Distinguished Flying Cross Flt. Lt. Hedgecoe has completed numerous operational sorties. He has continued to display outstanding keenness, determination and devotion to duty of a high order. He has destroyed at least four enemy aircraft and damaged one. He has also destroyed and damaged much enemy transport and one coastal vessel. Flt. Lt. Hedgecoe has now a fine total record of at least eight enemy aircraft destroyed and two damaged.

F/O. N. L. BAMFORD, D.F.C., R.A.F.V.R. (since deceased).—Since the award of the Distinguished Flying Cross F/O. Bamford has participated in the destruction of at least five enemy aircraft. He has also materially assisted in attacks against numerous transport targets. He has proved himself to be a very skilful navigator whose unfailing determination, courage and devotion to duty over a long period have been worthy of high praise. Since 1941 he has taken part in the destruction of ten enemy aircraft.

Distinguished Flying Cross

Act. F/O. H. BENNETT, R.A.F.V.R., No. 214 Sqn.
Act. Flt. Lt. J. MARGETTS, R.A.F.V.R., No. 582 Sqn.
Act. Flt. Lt. D. F. MILLER, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt. E. McK. McF. MILNE, R.A.F.V.R., No. 115 Sqn.
Act. Flt. Lt. E. W. MYERS, R.A.F.V.R., No. 90 Sqn.
Act. Flt. Lt. J. F. MYERS, R.A.F.V.R., No. 35 Sqn.
Act. Flt. Lt. T. PHILLIPS, R.A.F.V.R., No. 186 Sqn.
Act. Flt. Lt. S. E. REES, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt. E. E. RITSON, R.A.F.V.R., No. 186 Sqn.
Act. Flt. Lt. G. SHAW, R.A.F.V.R., No. 635 Sqn.
Act. Flt. Lt. A. J. W. SMITH, R.A.F.V.R., No. 101 Sqn.
Act. Flt. Lt. S. SMITH, R.A.F.V.R., No. 186 Sqn.
Act. Flt. Lt. F. A. STECHMAN, RA..F.V.R., No. 195 Sqn.
Act. Flt. Lt. L. T. R. H. WILLIAMS, R.A.F.V.R., No. 156 Sqn.
Act. Flt. Lt.. E. D. WHYBRAY, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Lt G. L. WRIGHT, R.A.F.V.R., No. 214 Sqn
F/O. S. T. ASHTON, R.A.F.V.R., No. 35 Sqn
F/O. J. BAILEY, R.A.F.V.R., No. 608 Sqn.
F/O. A. R. BARR, R.A.F.V.R., No. 161 Sqn.
F/O. H. BENNETT, R.A.F.V.R., No. 35 Sqn.
F/O. C. R. BENTLEY, R.A.F.V.R., No. 7 Sqn.
F/O. A. BROOMHEAD, R.A.F.V.R., No. 199 Sqn.
Flt. Lt. J. FAWCETT, R.A.A.F., No. 128 Sqn.
Act. Flt. Lt. H. N. COVENTRY, R.A.A.F., No. 199 Sqn.
Act. Flt. Lt. A. J. CRAB, R.A.A.F., No. 102 Sqn.
Act. Flt. Lt. W. J. CRYER, R.A.A.F., No. 149 Sqn.
Act. Flt. Lt. A. J. FLEMING, R.A.A.F., No. 186 Sqn.
Act. Flt. Lt. J. HUMPHREY, R.A.A.F., No. 582 Sqn.
Act. Flt. Lt. H. P. PECK, R.A.A.F., No. 622 Sqn
Act. Flt. Lt. W. F. RABBIT, R.A.A.F., No. 102 Sqn.
Act. Flt. Lt. L. TATE, R.A.A.F., No. 78 Sqn.
F/O. B. E. AINSWORTH, R.A.A.F., No. 101 Sqn.
F/O. R. W. BULLEN, R.A.A.F., No. 25 Sqn.
F/O. S. C. CAREY, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. H. M. CARRUTH, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. W. R. COURTIS, R.A.A.F., No. 675 Sqn.
F/O. R CURLING, R.A.A.F., No. 622 Sqn.
F/O. F. C. DOUGLAS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. R. S. HOY, R.A.A.F., No. 100 Sqn.
F/O. A. W. MATTHEWS, R.A.A.F., No 460 (R.A.A.F.) Sqn.
F/O. R. J. MAYES, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. R. H. MELVILLE, R.A.A.F., No 467 (R.A.A.F.) Sqn.

LENGTHY BRIEFING: Glider pilots being instructed in runway layout, and the marshalling of tugs and gliders for economy of time and space.

F/O. H. J. MILLS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. K. A. MORGAN, R.A.A.F., No. 582 Sqn.
Act. Wing Cdr. C. C. W. MARSHALL, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. W. F. BROWN, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. D. W. LAMONT, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Lt. D. S. BORLAND, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Flt. Lt. N. R. BRYDON, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Major R. J. BAYFORD, S.A.A.F., No. 37 Sqn.
Major C. A. GOLDING, S.A.A.F., No. 3 (S.A.A.F.) Sqn.
Major J. L. B VINEY, S.A.A.F., No. 30 (S.A.A.F.) Sqn.
Capt. A. C. G. BINSDELL, S.A.A.F., No. 7 (S.A.A.F.) Sqn.
Capt. J. S. BOTHA, S.A.A.F., No 4 (S.A.A.F.) Sqn
Capt. H. B. COLENBRANDER, S.A.A.F., No 22 (S.A.A.F.) Sqn.
Capt. A. T. DRYDEN, S.A.A.F., No. 454 (R.A.A.F.) Sqn.
Capt. P. E. HEYDENRYCH, S.A.A.F., No. 104 Sqn.
Capt. P. H HUGHES, S.A.A.F., No. 7 (S.A.A.F.) Sqn.
W/O. S. C. ROBERTSON, S.A.A.F., No 2 (S.A.A.F.) Sqn.
Act. Sqn. Ldr. A. DUNNING, R.A.F.V.R., No. 614 Sqn.
Act. Sqn. Ldr. A. H. JUPP, R.A.F.V.R., No. 43 Sqn.
Act. Sqn. Ldr. P. W. LOVELL, R.A.F., No. 260 Sqn.
Flt. Lt. D. W. C. ENGLAND, R.A.F.V.R., No. 260 Sqn.
Flt. Lt. M. W. SMYTH, R.A.F.V.R., No. 253 Sqn.
Flt. Lt. C. T. STIMPSON, R.A.F.V.R., No. 601 Sqn.
Act. Flt. Lt. J. FEELY, R.A.F.V.R., No. 70 Sqn.
Act. Flt. Lt. C. FISHER, D.F.M., R.A.F.V.R., No. 70 Sqn.
Act. Flt. Lt. J. W. PATTERSON, R.A.F.V.R., No. 253 Sqn.
Act. Flt. Lt. J. M. RALPH, R.A.F.V.R., No. 37 Sqn.
Act. Flt. Lt W. J. RICHINGS, R.A.F.V.R., No. 70 Sqn.
F/O. J. P. L. SHARP, R.A.F.V.R., No. 178 Sqn.
F/O. F. L. SIMPSON, R.A.F.V.R., No. 70 Sqn.
F/O. A. W. J. SMITHERS, R.A.F.V.R., No. 37 Sqn.
F/O. H. WHELDON, R.A.F.V.R., No. 614 Sqn.
P/O. W. T. P. JOHNSTONE, R.A.F.V.R., No. 148 Sqn.
P/O. W. D. C. PRATT, R.A.F.V.R., No. 70 Sqn.
P/O. J. C. WORDIE, R.A.F.V.R., No. 70 Sqn.
W/O. C. M. HALL, R.A.F.V.R., No. 148 Sqn.
Lt. J. H. KRUGER, S.A.A.F., No. 601 Sqn.
Lt. J. LEWIS, S.A.A.F., No. 70 Sqn.
Lt. E. J. H McTEER, S.A.A.F., No. 70 Sqn.
Lt. P. D. POTE, S.A.A.F., No. 601 Sqn.
2nd Lt. N. BAYLEY, S.A.A.F., No. 40 Sqn.
Act. Flt. Lt. P. J. ANDERSEN, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
Act. Flt. G. E. GIBSON, R.A.A.F., No. 115 Sqn.
Act. Flt. Lt. D. W. S. SCHOLES, R.A.A.F., No. 61 Sqn.
F/O. D. W. CAREY, R.A.A.F., No. 617 Sqn.
F/O. D. S. DONALDSON, R.A.A.F., No. 101 Sqn.
F/O. D. C. GORDON, R.A.A.F., No. 514 Sqn.
F/O. E. C. PATTEN, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Wing Cdr. C. W. BURGESS, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Act Sqn. Ldr. A. E. FENTIMAN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. D. ROBB, A.F.C., R.C.A.F., No 100 Sqn.
Flt. Lt. T. C. CALLAGHAN, R.C.A.F., No. 77 Sqn.
Flt. Lt. B. B. MILLER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Lt. F. J. O'CALLAGHAN, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Act. Flt. Lt D. A. BROWN, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Act. Flt. Lt. G. M. BURNS, R.C.A.F., No. 49 Sqn.
Act Flt. Lt. Ll. W. HENDERSON, R.C.A.F., No. 10 Sqn.
Act. Flt. Lt. C. N. HILL, R.C.A.F., No. 61 Sqn.
Act. Flt. Lt. I. E. RAVENSCROFT, R.C.A.F., No. 97 Sqn.
Act. Flt. Lt. J. F. WEAVER, R.C.A.F., No. 102 Sqn.
F/O. W. J. N. BURNETT, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. J. CEMBROWSKI, R.C.A.F., No. 10 Sqn.

Distinguished Flying Medal

Flt. Sgt. G. B. BRIGGS, R.A.F.V.R., No. 614 Sqn.
Flt. Sgt. T. MERRICK, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. J. HORSFORD, R.A.F.V.R., No. 2[illegible] Sqn.
Flt. Sgt. (now F/O.) J. ADAMSON, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. (now P/O.) J. FLETCHER, R.A.F.V.R., No. 156 Sqn. (since deceased).
Flt. Sgt. E. E. HARTLAND, R.A.F.V.R., No. 214 Sqn.
Flt. Sgt. D. W. E. HOUGHTON, R.A.F., No, 37 Sqn.
Flt. Sgt. V .C. LEWIS, R.A.F., No. 83 Sqn. (since deceased).
Flt. Sgt. (now P/O.) T. TONKIN (since deceased).
Sgt. K. PEARSON, R.A.F.V.R., No. 156 Sqn. (since deceased).
Flt. Sgt. (now Flt. Lt.) M. SMITH, No. 248 Sqn.
Sgt. (now W/O.) R. J. WILLIAMS, R.A.F.V.R., No 97 Sqn.

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil.)

Act. Sqn. Ldr. K. M. SCAMMELL, R.A.F.V.R.—Sqn. Ldr. Scammell is Commanding Officer of a Bomb Disposal Squadron and Bomb Disposal Adviser to Group Headquarters. The squadron has cleared mines and booby traps from eight airfields, in addition to numerous other sites and buildings used by units in this Group. An airfield was opened after 8,000 mines of all types had been removed from its surface without casualty. This officer has consistently shown himself to be a good organiser with initiative and imagination, and his personal example and devotion to duty have encouraged his men to face a dangerous task with energy and enthusiasm.

F/O. C. E. LYNDE, R.C.A.F., No. 142 Sqn.—One night in December, 1944, an aircraft crashed on landing. Fire broke out immediately in the cockpit, and F/O. Lynde, the navigator, was enveloped in flames. By the time the aircraft had come to a standstill the complete aircraft was burning furiously. F/O. Lynde, having already jettisoned the top hatch, climbed out on to the port wing, the starboard side being ablaze. Finding the pilot had failed to get to safety, F/O Lynde returned to the blazing aircraft, released the pilot's harness and dragged him to safety through the top hatch, receiving severe burns whilst so doing. His prompt and courageous action undoubtedly saved the pilot's life.

Badge of No. 153 Squadron, R.A.F. "Noctividus" (Gifted with Night Sight)

MEDITERRANEAN AIR CONFERENCE: (Left to Right) Air Vice-Marshal G. B. A. Baker, Chief of Staff, M.A.A.F.; Air Marshal Sir Guy Garrod, Deputy Air C. in C., M.A.A.F.; Brigadier General C. P. Gabell, Dir. of Operations and Intelligence, M.A.A.F.; and Air Comdre. L. T. Pankhurst, Dep. Dir. of Operations, M.A.A.F.

Roll of Honour

Casualty Communiqué No. 498.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of these, 200 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. D. E. Addyman; L.A/C. R. F. Atkinson; Sgt. C. Booth; P/O. P. Grant; Flt. Lt. J. B. Hampson; L.A/C. F. Hellawell; Flt. Sgt. J. H. Jackson; Sgt. L. G. Kelly; Flt. Sgt. T. Murphy; Flt. Sgt. H. J. Newling; Sgt. R. C. Richards; Sqn. Ldr. D. L. Ryalls; Sgt. R. Taylor; Flt. Sgt. W. A. Waite; F/O. D. Webber.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. P. H. Brown; P/O. W. H. Burnett; Sgt. G. B. Senior; Sgt. A. Simpson; Sgt. F. Storer; W/O. J. White, D.F.M.; P/O. E. H. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. G. Aldworth; Sgt. A. McN. Anderson; Sgt. B. E. Ansell; Sgt. J. Banks; P/O. A. E. Barnes; Flt. Sgt. G. Barry; P/O. C. E. Blanchette; F/O. R. Bolsover; Sgt. N. Bolt; P/O G. P. R. Bond, D.F.C.; Flt. Sgt. R. M. Bond; Sgt. N. H. Bowyer; Flt. Sgt. G. W. Bramley; Sqn. Ldr. R. Brown; Sgt. R. E. Burgum; Sgt. H. B. Bushell; Sgt. P. O. Camm; Sgt. R. W. Carpenter; Sgt. W. P. Clough; F/O. S. Colbert; Flt. Sgt. L. J. Collis; Sgt. H. Conrad; Flt. Lt. J. M. Crabb; P/O W. Currie; Sgt. J. V. Dadson; Sgt. D. D. R. Dallaway; Flt. Sgt. R. J. Davenport; P/O. D. M. Davies; Sgt. R. H. Doull; F/O. J. H. Duncan; Sgt. McI. Dunlop; F/O. W. H. Dyke; Flt. Sgt. T. Eckersley; Sgt. N. R. J. Evans; Sgt. R. Fabian; W/O. D. B. Finlay; F/O. L. J. Frost; Sgt A. G. Fuller; Flt. Sgt. W. C. Gadsby; P/O. R. H. Garbutt; F/O. J. N. Gill; Sgt. J. A. Goodall; Sgt. K. E. Harris; Flt. Sgt. A. H. Hartshorn; Sgt. A. E. Head; Sgt. R. J. Heal; F/O. R. J. Hodges; Sgt. D. R. Jessop; Flt. Sgt. G. C. Johnson; Sgt. K. L. Johnson; Sgt. G. Jowett; Sgt. A. M Kiltie; Sgt. W. R. Kinder; Sgt. R. B. Laroche; Sgt. L. N. J. Laver; Sgt. R. Laverick; Sgt. G. S. Lawn; Sgt. D. B. G. Mackenzie; Sgt. J. P. McKilligin; Flt. Sgt. F. J. Marriott; Sgt. C. A. W. Matthews; Sgt. S. F. May; P/O. A. Morassi; Sgt. A. W. Mortimer; Sgt. D. A. Neal; Flt. Sgt J. H. P. O'Neill, B.E.M.; Flt. Lt. C. J. E. Palmer; F/O. G. Palmer; Sgt. J. Palmer; Flt Sgt. E. D. Panniers; Sgt. C. Parker; Sgt. D. Parkin; Sgt. C. G. Payne; Flt. Sgt. D. C. Pearse; Son. Ldr. A. J. Pinhorn; Sgt. W. Prest; Sgt H. W Richardson; F/O. F. D. Roberts; Flt. Sgt. D. Robertson; W/O. C. J. Skinner; Sgt. E. W. Smith; Sgt. W. McK. Smith; Sgt. E. T. Stallard; W/O. R. N. Stares; Flt. Sgt. S. B. Stevenson; Sgt. F. T. Stiling; F/O. R. Stobo; Flt. Lt. B. E. Stourton; P/O. S. R. Taylor; Flt. Sgt. F. Thompson; Sgt. M. Turner; Sgt. G. B. Tutt; Flt. Sgt. J. C. K. Webb; P/O. J. F. Webster; Flt. Lt. R. E. Wesson, A.F.M.; P/O. R. Whewav; Sgt A. White; F/O. R. L. White; Sgt. S. White; Flt. Sgt. H. J. Wilkinson; Sgt. P. F. Willis-Culwitt; Flt. Sgt. M. C. A. Wilmer; Flt. Sgt. L. T. Wilmshurst; Sgt. W. M. Wilson; P/O. J. H. Wyborn; Sgt. E. H. Woods; F/O. G. T Young.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. E. E. Brett; Flt. Sgt. W. H. Elsey.

WOUNDED OR INJURED IN ACTION.—L.A/C. A. W. Gordon; Sgt. I. G. C. Graham.

MISSING, BELIEVED KILLED IN ACTION.—F/O. F. E. R. Gurden; Sgt. A. F. Liddle; Flt. Sgt. A. G. Mace; F/O. R. R. Preece; Sgt. P. Radley; Flt. Lt. A. S. Smith; Sgt. W. T. Stapleton; Flt. Lt. D. J. S. Turner; Sgt. P. L. Waldon.

MISSING.—Sgt. J. Atkinson; Flt. Sgt. L. R. Ayres; Flt. Lt. J. M. Barrass; Flt. Sgt. R. Bolt; Sqn. Ldr. A. L. Carter; A/C.1 R. F. Cole; F/O. W. Dalgarno; Flt. Lt. G. Donald; F/O. E. J. Fletcher; F/O H. C. Godfrey; P/O. J. G. Gower; Flt. Lt. N. V. Haynes; Sgt. R. E. McCann; P/O. W. R. D. MacLeod; Sgt. P J. Mansell; Sgt. S. Marshall; W/O M. C. Medcalf; Flt. Lt. O. S. Milne; Flt. Sgt J. M. Murray; Flt. Sgt. B. Nundy; Flt. Sgt. J. Orman; Sgt. G. F. Owen; Flt. Lt. R. A. M. Palmer, D.F.C.; Flt. Sgt. A. R. Rayner; Flt. Lt. G. Russell, D.F.C.; F/O. R. F. Vidler; F/O. A. J. Watson; F/O. F. T. Watson, D.F.M.; F/O. B. Yates; Flt. Sgt. R. K. Yeulett.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. Bil-

IATION

fen; Sgt. H. G. Black; L.A/C. E. A. Fouracres; Sgt. R. Hamilton; L.A/C. P. Hollingsbee; Sgt. D. K. Jenkins; W/O. T. W. Johnson, D.F.M.; P/O. B. R. Pitt; Sgt. J. L. Turner; F/O. A. Whiteley, D.F.C.; Flt. Sgt. A. J. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. Bowker; Sgt. D. T. Portch; L.A/C. E. B. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. A. N. Clegg; Cpl. L. Eastwood; L.A/C. R. A. Hart; F/O. P. C. Lennard; L.A/C. R. A. Lynch; Cpl. D. H. Porter; L.A/C. E. Slattery; L.A/C. R. Williams; L.A/C. R. E. Wilmot.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Cpl. P. J. Mummery.

DIED ON ACTIVE SERVICE.—A/C.1 R. C. Barrow; A/C.1 W. A. Briggs; L.A/C. F. K. Butler; L.A/C. C. J. Clarke; Cpl. D. A. Clarke; Cpl. A. Cowin; A/C.2 J. H. Dunkley; L.A/C. F. A. Evans; L.A/C. W. J. Holmes; Cpl. R. C. Martin; L.A/C. G. Miles; A/C.1 D. G. Moffat; Cpl. W. W. S. Moyle; L.A/C. R. H. Richardson; L.A/C. G. D. Rowland; A/C.1 A. J. Sears; Cpl. E. Stewart-Walker; L.A/C. R. Willoughby.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. C. J. Aldred; F/O. N. J. Allen; Sgt. W. D. Belshaw; Sqn. Ldr R. W. H. Gray; Flt. Sgt. R. Heasman; Flt. Sgt. B. Wynne-Cole.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. M. J. Hurley; Flt. Sgt. G. McMaster; Flt. Sgt. A. McL. Woodford.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. M. Benzie; P/O. D. A. Carter; F/O. K. C. Dyer; P/O. W. G. Moxey; Flt. Sgt. S. J. F. Palmer; Flt. Sgt. E. J. Philipson; Flt. Sgt. J. E. Swan.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. D. G. Badgery.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. B. L. Hussey; Flt. Sgt. P. M. Pearce; F/O. F. C. Riley.

MISSING.—Flt. Sgt. C. D. Donaghue; W/O. R. A. Dowe; P/O. P. C. Edwards; Flt. Sgt. D. M. L. O'Halloran; P/O. N. F. Swift.

KILLED ON ACTIVE SERVICE.—Flt. Lt. J. D. Stubbs, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. D. T. Balmanno; Flt. Sgt. E. D. Dale.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. S. Angelini; F/O. D. A. Brigden; Flt. Sgt. E. H. Cooper; Flt. Sgt. M. V. Durling; Flt. Sgt. A. J. Eberle; Flt. Lt. D. W. A. Harling, D.F.C.; Sgt. D. D. Hoskins; F/O. R. W. Keller; F/O. C. S. Newton; Flt. Sgt. C. H. Pogson; F/O. D. C. Reid; P/O. R. S. Stevens.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. F. F. G. Allan; Sgt. J. Dixon; P/O. W. Forrest; Flt. Sgt. B. D. Howard; P/O. J. McIvor; P/O. D. A. Price; P/O. D. R. Robinson; Flt. Lt. J. V. Russell, C.G.M.; Flt. Lt. W. M. Sterns, D.F.C.; Flt. Sgt. S. Tatai; W/O. J. A. Wheeler.

PREVIOUSLY REPORTD MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. W. Adamson; F/O. J. H. Balloch; Flt. Sgt. N. Barrett; Flt. Sgt. F. G. Benning; F/O. J. R. Bonneville; F/O. G. H. Buchanan; F/O. J. J. Chandler; P/O. J. B. Chess; F/O. P. C. Cox; P/O. J. F. G. R. Dehoux; F/O. L. D. Dingley; Flt. Sgt. R. Dixon; Flt. Lt. P. H. Doig; Sgt. M. F. Donaldson; Sgt. K. A. Farmer; F/O. E. D. Fogg; Sgt. A. F. Gander; F/O. C. G. Gorrie; F/O. F. J. Gregory; W/O. T. J. Griffin; W/O. L. S. Hammett; W/O. W. Hawkins; P/O. A. McN. Laughland, D.F.M.; F/O. J. R. Leaman; Flt. Sgt. J. R. A. Leblanc; Sgt. J. J. B. L. Leduc; F/O. R. MacLean; Wing Cdr. A. C. Mair; P/O. R. F. Mang; Flt. Sgt. A. Menzies; P/O. W. Plumkett; W/O. I. F. Ruppel; Sgt. J. Sadeski; F/O. J. S. Smith; F/O. S. M. Smith; Flt. Sgt. H. Suthers; W/O. J. B. Toombs; P/O. R. H. Wade; F/O. R. H. Wilson; Flt. Lt. E. S. Winn; W/O. R. F. Woods.

WOUNDED OR INJURED IN ACTION.—P/O. E. T. Flanagan; P/O. R. C. Flynn.

MISSING.—F/O. A. A. Dixon; F/O. R. A. Ebber; F/O. S. D. Hewson; F/O. F. W. How; P/O. C. D. B. Hubley; F/O. A. T. Leblanc; F/O. K. O. McDivitt; P/O. J. A. S. MacGregor; F/O. R. K. Nickle; P/O. E. W. Page; P/O. N. R. Springstein; P/O. C. R. Tait.

KILLED ON ACTIVE SERVICE.—L.A/C. G. R. Bell; F/O. K. J. McDonald; L.A/C. J. L. B. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. R. V. Lynch.

CO-BELLIGERENT! A captured Heinkel 177, wearing the familiar roundels and "invasion" stripes, now being flown by the R.A.F.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. D. E. Barnard.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. J. W. L'Abbe; P/O. J. A. Ludwig; Flt. Sgt. L. S. O'Leary.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. N. J. Callan; P/O. A. S. Frampton; Flt. Sgt. G. E. Hamilton; P/O. K. W. Orchiston.

WOUNDED OR INJURED IN ACTION.—W/O. R. G. McCartney.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. S. S. Williams.

MISSING.—F/O. B. M. Hall; W/O. R. R. Zellman.

KILLED ON ACTIVE SERVICE.—W/O. N. E. McL. MacDonald.

South African Air Force

KILLED IN ACTION.—Lt. G. P. Cronin; Cpl. H. V. Kilburn; Lt. P. S. Moore; Lt. P. W. Nourse.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. G. E. Savage.

MISSING, BELIEVED KILLED IN ACTION.—Lt. L. F. H. Catherine; Lt. C. J. Jooste.

MISSING.—Lt. A. B. Collett; Lt. R. G. Cummings; Lt. A. N. Fisher.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. J. G. Dewit.

Badge of No. 622 Squadron, R.A.F. "Bellamus Noctu" (We Fight by Night).

Casualty Communiqué No. 499.

Of the names in this list, 198 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. J. Blackburn; Sgt. J. C. Mays.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. M. Byrne; F/O. J. Gilhespy; Flt. Sgt. W. T. G. Peckham; Flt Lt. P. E. Raw, D.F.C.; W/O. J. H. Reeves; F/O. F. C. Rousseau; Flt. Sgt. K. J. Shropshall.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. F. Andrew; Sgt. L. Banks; Flt. Sgt. P. A. Bennett; Flt Sgt. W. C. Berry; Sgt. F. Boyd; Sgt. R. Boyde; Flt. Sgt. A. Brice; P/O. D. J. Chase; Flt. Sgt. H. Cherns; Sqn. Ldr. K. A. Clack; Sgt. N. R. Cottrell; F/O. R. J. C. Croxford; Sgt. C. F. C. Davis; F/O. K. S. Dickins; Sgt. G. Donald; Sgt. J. D. Dyson; P/O. D. H. Edwards; F/O. W. J. Evans; Sgt. J. Flavell; Sgt. R. J. Harris; Flt. Lt. P. R. H. Henry; P/O. P. Hicken; Sgt. A. Holt; Sgt. A. E. Hooper; Sgt. W. Hughes; F/O. J. D. Hurley; Sgt. P. J. Jeffs; W/O. F. P. Jones; Sgt. R. A. W. Keetch; Flt. Sgt. P. C. King; Sgt. S. J. Lunn; Sgt. D. W. McGhee; Sgt. W. McKelvie; Sgt. H. G. McNeight; Wing Cdr. N. R. Mansfield, D.F.C.; Flt. Sgt. K. D. Mardon-Mowbray; F/O. B. J. Marks; Sgt. W. C. Mason; Flt. Sgt. W. Mitchinson; P/O. D. C. Nowell; Sgt. L. W. A. Peall; F/O. G. W. Penrose, D.F.C.; Sgt. J. F. Plummer; Sgt. F. V. Rhaney; F/O. J. H. Richards; Sgt. G. A. Robinson; Sgt. R. Rook; Sgt. J. E. Scruton; Sgt. J. Shields; Sgt. B. Smith; Flt. Lt. R. D. Smith; Flt. Sgt. F. K. Smith; Sgt. T. W. Soulsby; Flt. Sgt. G. C. Spurden; Flt. Lt. C. R. Swinney, D.F.C.; Flt. Sgt. R. F. Thompson; F/O. M. G. Turner; Sgt. G. H. Warren; F/O. K. H. Wilde; Flt. Sgt. C. L. Y. Wilkins.

WOUNDED OR INJURED IN ACTION.—F/O. C. P. Hibbott; Sgt. A. Patterson; Sgt. I. A. Pratt.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. W. Bennett; Sgt. D. T. Muir; P/O. J. A. C. Strange; F/O. M. H. Sullivan.

MISSING.—F/O. F. W. Bailey; Flt. Lt. G. D. Body; P/O. M. J. Boylan; P/O. R. J. Clarke; Sgt. E. A. Cross; Flt. Lt. A. M. Crow, D.F.M.; F/O. M. McL. Dowding; Flt. Sgt. A. Eccleston; Flt. Sgt. D. W. Evans; Sgt. G. Faulkner; F/O. V. O. Gilbert; Flt. Lt. R. W. Gillham; Group Capt. C. L. Green, D.S.O., D.F.C.; F/O. F. J. Gunn; Sgt. G. F. Haslam; F/O. J. O. Hawdon; Flt. Sgt. V. G. Hobbs; F/O. F. E. Hodgson; P/O. J. I. Hoyle; Flt. Sgt. P. G. Lamb; F/O. W. T. Lambert, D.F.M.; Sgt. E. Left; Sgt. K. F. Matthews; Sgt. W. E. Mawson; Sgt. D. N. Mepham; F/O. J. Middleton; F/O. D. J. Mole; Sgt. T. G. Newman; Sgt. E. Nicholson; Flt. Sgt. G. Owen; Sgt. J. Paterson; F/O. E. Roberts; F/O. H. Ross; Flt. Sgt. S. B. Shaw; Sgt. J. L. Simpson; P/O. J. Stevenson; Flt. Lt. N. C. Tatam; Flt Lt. P. A. Thomas; Sgt. H. A. Tuck; F/O. J. H. Waldron; Sgt. J. G. Williams.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. Bazley; L.A/C. W. Crooks; L.A/C. E. Davies; A/C.1 J. F. Johnson; L.A/C. B. Jones; L.A/C. H. E. Osborne; L.A/C. J. Sager.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. W. C. Freeborn; Sgt. R. Hunt; Flt. Sgt. D. R. Pocock; Sgt. N. E. Pratt; Sgt. G. G. G. Rann; F/O. C. K. Yeo.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 C. W. Abbott; L.A/C. A. W. Baines; L.A/C. H. Bannister; Flt. Lt. S. J. P. Blackwell, D.F.C.; L.A/C. B. H. Grimshaw; A/C.1 S. F. Kearns; L.A/C. D. MacL. Lapsley; L.A/C. T. McCann; L.A/C. C. Palfrey; Cpl. A. Sparrow; L.A/C. H. Spencer; L.A/C. J. Varley; L.A/C. P. F. Watson; Cpl. F. K. Winter.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. A. A. Anderson; Sgt. J. R. Gosney; Flt. Sgt. J. H. Sheridan; A/C.1 T. Wilson.

DIED ON ACTIVE SERVICE.—L.A/C. G. A. Brindle; Flt. Sgt. A. F. Hamilton; L.A/C. A. G. Jelfs; F/O. N. L. Oddy; L.A/C. L. W. Palmer; Sgt. J. R. Taylor; Cpdl. B. Walker; Flt. Sgt. W. A. Williams.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. M. J. Spencer, D.F.C.; Flt. Sgt. E. T. Williams.

Royal Australian Air Force

KILLED IN ACTION.—P/O. J. W. Webb.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. P. R. Callahan; F/O. A. D. Hoffman; F/O. J. S. Pritchard; F/O. J. W. Sharpe; F/O. A. K. Steinbeck; Flt. Sgt. W. J. Theyer; W/O. A. E. Thomas.

MISSING, BELIEVED KILLED IN ACTION.—W/O. H. A. Hales; W/O. L. G. Robinson.

MISSING.—Flt. Sgt. K. H. Barnett; W/O. T. E. Craddock; Flt Sgt G. F. Day; Flt. Sgt. C. K. Deed; Flt. Sgt. R. J. Dickie; W/O. R. K. Norsworthy; W/O. J. F. Quinn; F/O. M. C. Skarratt; Flt. Sgt. R. I. Stewart; F/O. J. M. Ward.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. B. Eassie.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. J. W. L. F. Bernier; Flt. Sgt. L. S. Brown; W/O. D. R. Currie; F/O. J. L. A. M. Desmarais; P/O. J. E. L. Dubois; F/O. W. R. Fair; Flt. Sgt. E. J. Farrell; P/O. R. C. Gauthier; Flt. Sgt. J. V. Grant; Flt. Sgt. E. P. Harve; F/O. D. Hitchcock; P/O. J. R. J. C. Labrecque; Flt. Sgt. J. R. Lariviere; F/O. G. H. March; Flt. Sgt. J. M. Paradis; Flt. Sgt. E. A. Rhude.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. A. Brammall; P/O. R. V. Burch; Flt. Lt. D. E. Cawker; F/O. K. A. Cole; P/O. D. J. Fasthan; Flt. Lt. W. T. Fulton; P/O. J. W. Gibbons; Sgt. G. Gow; P/O. E. J. Halbert; P/O. O. L. H. Harding; P/O. D. W. Howell; F/O. O. L. Jackson; Sgt. J. J. L. Jette; P/O. S. Kay; P/O. L. J. Keely; F/O. F. J. King; F/O. J. D. Laidlaw; P/O. J. Latham; P/O. C. A. Lavery; Flt. Sgt. R. A. McBeath; P/O. G. R. MacHesney; P/O. P. A. McIntyre; F/O. G. I. MacKay; Sgt. V. E. Reed; P/O. E. J. Rush; Flt. Sgt. D. Sinclair; Flt. Lt. J. J. Stephen; F/O. T. L. W. Teasdale; P/O. R. F. Thibedeau; Sgt. G. F. A. Thompson; F/O. J. H. Warkentin; Sgt. J. Whittaker; W/O. T. O. Wilson; P/O. F. C. Wood; W/O. A. E. Yaworski.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. N. E. Bennett; F/O. J. P. R. F. Brazeau; Sgt. M. E. Burnard; Sgt. R. G. A. Burt; W/O. C. F. Cameron; P/O. G. E. Chute; P/O. C. T. Clark; P/O. C. MacK. Colquhoun; Sgt. R. L. Coulter; F/O. J. F. Creba; W/O. G. J. Cronk; F/O. E. J. Deemer; F/O. W. A. Dixon; P/O. S. G. Dowdell; Flt. Sgt. P. Dutchak; P/O. J. R. Dutton; Flt. Lt. P. C. Edwards; P/O. D. R. Eley; F/O. B. Emmerson; W/O. G. Finlayson; Flt. Lt. A. P. Fyfe; W/O. A. T. Gardiner; P/O. R. E. Gillanders; P/O. A. E. Guthrie; Sgt. L. G. Hanton; P/O. J. A. Harris; Sqn. Ldr. A. J. Hughes; Sgt. J. J. B. B. Huot; W/O. F. E. Johnson; F/O. W. C. Kingsley; P/O. J. O. Koivu; P/O. O. A. Linton; P/O. O. Lytle; Sgt. D. J. MacDonald; Sgt. D. W. Matthews; F/O. M. Marder; P/O. L. Marshall; P/O. J. May; F/O. J. R. Mayo; F/O. E. W. Mellander; W/O. R. J. Middlemas; W/O. J. N. G. Milot; Flt. Sgt. S. A. Minter; W/O. C. E. Morgan; Flt. Sgt. H. U. Morris; Flt. Lt. R. Munro; W/O. F. R. V. Nello; Flt. Sgt. M. L. Nesvold; Flt. Sgt. H. W. Nixon; P/O. A. L. Olsson; Flt. Sgt. B. M. O'Hara; W/O. J. D. Owen; P/O. C. G. Phinney; W/O. D. A. Powley; P/O. T. H. Proudlock; Sgt. K. L. Radcliffe; P/O. J. A. Raven; F/O. L. A. L. Renaud; F/O. G. A. Roberts; Sgt. A. E. Roden; F/O. B. L. Rogers; Flt. Sgt. W. E. Sargent; Flt. Sgt. P. H. Simonson; P/O. D. J. Sinclair; F/O. J. A. Stephens; P/O. W. Taylor; Flt. Sgt. B. V. Tedford; P/O. C. S. Turner; F/O. J. D. B. Ulrickson; P/O. F. J. Vid; Flt. Lt. C. H. Wheatley; P/O. S. A. Wick; F/O. E. K. Williams; W/O. R. H. Wilson; W/O. L. H. Woodruff; F/O. J. F. Wright.

MISSING, BELIEVED KILLED IN ACTION.—F/O. P. Barlow; W/O. F. W. Campbell; F/O. E. G. Fox; F/O. E. R. Newland; Flt. Lt. K. F. Sage; Flt. Sgt. W. A. Wright.

MISSING.—P/O. K. H. Austin; P/O. A. G. W. Blayney; Flt. Sgt. W. J. Byrne; F/O. R. L. Cann; Flt. Lt. E. C. Carpenter; Sgt. M. M. Cummins; Flt. Sgt. P. C. Doherty; F/O. H. R. Dryer; P/O. G. G. Fox; Flt. Sgt. J. W. Green; P/O. A. W. Haley; Sgt. T. R. Harrigan; P/O. E. R. Kaesmodel; P/O. W. E. Leese; P/O. D. J. MacFarlane; Flt. Sgt. J. McGee; F/O. J. M. Phillips; Flt. Lt. A. W. Reif; W/O. P. Uzelman; F/O. F. H. Wilsher; F/O. G. D. Wilson; Flt. Sgt. S. E. Zsdorozny.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. B. H. MacIsaac.

DIED ON ACTIVE SERVICE.—L.A/C. G. J. Anderson; Sgt. G. R. Rodman.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. G. Bernard; W/O. J. Gertside.

MISSING.—Flt. Sgt. T. W. Coombridge; F/O. H. S. Miles; Flt. Lt. O. P. Olson, D.F.C.

South African Air Force

MISSING.—W/O. A. M. Hamilton.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. A. E. Goodman.

Casualty Communique No. 500

Of the names in this list, 141 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. P. R. Attwooll; W/O. G. F. Buck; Flt. Lt. H. P. Gibbons; Flt. Lt. G. P. Mullan; F/O. I. G. Walker; F/O. J. R. Watkins; Flt. Lt. I. C. R. Wellstead, D.F.M.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. R. Blair; W/O. J. D. Cook; Flt. Sgt. T. D. Duggan; Flt. Sgt. E. A. Harrison; Sgt. J. Jefferson; P/O. G. E. Prouting; Flt. Sgt. L. S. Quelch.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. P. Allwell; Flt. Sgt. P. H. Armstrong; Flt. Sgt. W. H. Beere; Flt. Sgt. D. N. Bell; Sgt. P. J. Bennett; Sgt. J. Berry; F/O. D. L. Biggs; F/O. G. Bodden; Flt. Sgt. J. Briggs; F/O. J. S. Cant; Flt. Sgt. V. N. Cawdery; Sgt. J. A. Chambers; Flt. Sgt. D. A. Cole; Sgt. D. H. W. Cook; W/O. C. W. Croft; Sgt. S. Edwards; Flt. Sgt. A. J. Elliott; Sgt. A. L. Fairbrother; Sgt. D. A. Ferguson; Flt. Sgt. J. Freedman; Sgt. R. W. Gooch; Flt. Sgt. N. F. W. Gooding; Sgt. J. L. Green; Sgt. H. Greenfield; Sgt. R. C. Hall; Sgt. C. R. Hanks; Flt. Sgt. W. N. Hartley; Sgt. L. Harvey; Flt. Sgt. O. S. Harvey; Sgt. E. Heaton; Sgt. T. Heslop; Flt. Sgt. H. O. Hill; Sgt. C. A. Hilton; P/O. W. Hodgson; Flt. Sgt. G. Hogg; Sgt. A. Howcroft; Sgt. J. I. Jones; Sgt. H. M. Keates; F/O. J. M. Keay; Sqn. Ldr. E. H. C. Kee; Sgt. J. Kenyon; Sgt. A. Kewin; Sgt. R. C. McLaren; P/O. R. H. Megainey; Sgt. W. Meikle; Flt. Sgt. C. Morrice; Sgt. H. E. Mottishaw; Sgt. L. Murphy; Flt. Sgt. J. C. Nicol; Flt. Sgt. A. L. Nichols; Sgt. L. J. Pasfield; W/O. S. W. Payne; Flt. Lt. I. MacL. Pearson; Flt. Sgt. G. G. Pemberton; Flt. Sgt. E. W. Proctor; Sgt. J. M. Roberts; Flt. Sgt. J. W. Robertson; Sgt. C. P. Ryan; Flt. Lt. D. L. Sedgwick; P/O. F. Shepherd; Sgt. J. Smith; Sgt. N. R. Smith; Flt. Lt. R. G. Spicer; P/O. W. Still; W/O. F. Stokes; Flt. Sgt. I. F. Stuart; Flt. Sgt. J. A. Taylor; Sgt. S. I. Thompson; Sgt. J. L. Tillam; Sgt. J. M. Townsend; Sgt. H. C. Walton; Sgt. E. E. Watson; F/O. W. R. Waugh; F/O. H. Whitmill; F/O. R. J. Wilson; Flt. Sgt. G. Young.

WOUNDED OR INJURED IN ACTION.—P/O. C. J. Forrester.

MISSING, BELIEVED KILLED IN ACTION.—P/O. E. P. Bates; F/O. S. D. Booth; Sgt. F. R. Cragg; W/O. W. H. A. Lye; Sgt. P. Monerney; Sgt. W. M. Mann; Sgt. D. K. Moss-Vernon; Act. F/O. R. W. Reaks; Sgt. G. W. Richards; Sgt. A. Robertson; Flt. Sgt. R. E. S. Sanger; Sgt. M. Schonberg; Sqn. Ldr. W. H. B. Short, D.F.C.

MISSING.—Sgt. D. A. O. Balls; Sgt. J. Barton; Flt. Lt. W. N. Bingham; Sgt. R. F. Bloy; Sgt. G. R. Boden; Sgt. L. B. Bourne; P/O. J. W. Bridgwood; Flt. Sgt. S. Brockbank; Sgt. J. Brownbridge; Sgt. K. Callaby; W/O. N. C. Churchill; Flt. Sgt. A. J. McF. Cooper; P/O. R. Crompton; Sgt. E. J. Culmer; Flt. Sgt. S. W. G. Currigan; Flt. Sgt. N. Dennerly; Flt. Lt. M. De-Kerdrel; Flt. Lt. M. F. Edwards; F/O. B. R. Emmett; F/O. E. G. Essenhigh; Wing Cdr. D. B. Falconer, D.F.C., A.F.C.; Sgt. A. A. Flood; Flt. Sgt. D. C. Foster; Flt. Sgt. G. J. A. Groom; W/O. G. Harris; Sgt. G. Harrison; Flt. Lt. S. B. H. Harrison; Sgt. P. O. Haynes; Flt. Sgt. J. C. Hetherington; Flt. Sgt. R. D. Hilton; W/O. C. R. Hines; Sgt. J. H. Hipwell; P/O. E. Hislop; W/O. C. J. Holford; Sgt. D. W. Holmes; F/O. J. R. Holmes; Sgt. T. W. G. Homer; Flt. Lt. C. Hyde; Flt. Sgt. J. M. Johnstone; Sgt. D. D. Jones; Flt. Sgt. H. Jones; Flt. Sgt. J. H. Jones; Flt. Sgt. R. Kear; Sgt. D. A. Kelly; Flt. Sgt. D. A. Kenningham; Sgt. S. Kent; Flt. Sgt. E. Leese; Sgt. R. J. Lewis; W/O. T. A. Leyden; Flt. Sgt. E. P. Lindenboom; Flt. Sgt. H. T. Little; Flt. Sgt. W. H. H. Marshall; Flt. Lt. P. T. F. May; Sgt. D. W. Maycock; Flt. Sgt. S. J. S. Maynard; Sgt. K. Merritt; Sgt. J. W. Moore; Sgt. A. J. Morley. Sgt. R. Morley; P/O. B. K. Nice; Flt. Sgt. G. L. Osmond-Jones; F/O. J. A. Patterson; Sgt. D. J. Perkins; Sgt. B. J. Phillips; Sgt. V. T. Phillips; F/O. D. Pollard; P/O. R. W. Pollinger; W/O. F. J. Poole, D.F.M.; Flt. Sgt. A. R. Price; Flt. Sgt. T. V. Raine; Flt. Sgt. F. B. Rees; P/O. N. G. Sievwright, D.F.C.; Sgt. T. Scott; P/O. J. A. D. Shemeld; F/O. B. K. G. Slade; Sgt. G. Spreadbury; W/O. A. J. L. Stewart; P/O. E. A. Thomas; F/O. J. A. Thomson; Flt. Sgt. J. W. Tutill; Sgt. H. Varey; Sgt. R. E. Ward; F/O. F. G. Waring; Sgt. A. Waterhouse; P/O. K. W. Watson; Sgt. L. W. J. White; Flt. Sgt. N. A. White; Flt. Sgt. C. Williams; Sgt. J. Wright.

KILLED ON ACTIVE SERVICE.—F/O. N. L. Bamford; Flt. Lt. D. E. Cottrell; L.A/C. W. J. Dray; F/O. G. G. Flack; Sgt. R. Hancock; Sqn. Ldr. E. R. Hedgecoe, D.F.C.; Flt. Sgt. H. Holmes; L.A/C. J. Hymans; Flt. Lt. G. E. Johnson; Sgt. J. W. Terzza.

NIGHT PHOTOGRAPHER: Mosquito of a reconnaissance wing on the Continent, ready for the night's operations.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. Jones.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. W. E. Bedford; A/C.1 A. G. Chapman; L.A/C. D. S. Christie; Cpl. J. R. Denton; Sgt. D. H. Easton; L.A/C. E. J. Holloway; L.A/C. G. A. Kevans; A/C.1 J. Leatherbarrow; L.A/C. C. Luxford; Cpl. R. W. Meacham; A/C.1 C. E. K. Oates; Sgt G. Pritchard.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sqn. Ldr. T. S. Brotherstone; L.A/C. T. J. Clifford.

DIED ON ACTIVE SERVICE.—L.A/C. A. Anderson; L.A/C. D. G. Bichard; A/C.2 D. V. Brewer; Cpl. C. J. Campbell; Cpl. W. Crewe; L.A/C. G. G. Hayden; A/C.1 R. Jones; F/O. D. Moore.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. M. M. Holgate; Flt. Sgt. R. Taylor.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION NOW PRESUMED KILLED IN ACTION.—F/O. B. F. Lawler; W/O. A. E. McGee.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. F. T. R. Bruce; P/O. J. D. Greenwood; Flt. Sgt. K. R. Lindenburg; P/O. H. R. Stuchbury; W/O. W. J. Waycott; Flt. Sgt. J. W. Wood.

MISSING, BELIEVED KILLED IN ACTION.—F/O. N. D. Harrison.

MISSING.—Flt. Sgt. F. Bennett; F/O. A. G. Comer; F/O. G. W. Duggan; F/O. R. H. Kench; W/O. D. Royds.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. R. C. Bell.

Royal Canadian Air Force

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—W/O. H. D. Mallory.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. L. J. Boudreau; P/O. H. A. Brad; F/O. D. A. Crosbie; P/O. H. W. Davis; F/O. L. D. Deloughry; Flt. Sgt. J. W. Edgar; F/O. W. R. Ellwood; W/O. J. D. Fiddes; P/O. J. W. Kerr; F/O. J. M. McLay; F/O. G. H. Parker; P/O. D. A. Pastorius; P/O. W. G. Stevens; F/O. R. K. Thomson; F/O. J. E. Tinline; P/O. Z. R. Trudeau.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. H. G. Boissevain; P/O. L. D. Bowden; P/O. G. R. Boxall; P/O. H. A. A. Breeze; P/O. J. P. G. Brisson; Flt. Lt. W. C. Cracknell; P/O. A. G. Devoy; P/O. N. T. Edmondson; F/O. H. M. Elliott; Flt. Sgt. L. A. Ferguson; F/O. C. T. Hartley; Flt. Sgt. C. H. Havill; P/O. R. C. Haycock; Flt. Sgt. R. F. Jarvis; W/O. D. J. Laberge; P/O. R. A. Leader; P/O. J. H. C. Legault; P/O. W. Y. McNeil; P/O. D. F. Malyon; Sgt. J. Mulligan; P/O. H. F. Orr; Sgt. W. M. Power; F/O. L. E. Robinson; W/O. C. F. D. Steel; F/O. E. T. Tinker; P/O. E. A. Vigor; W/O. C. L. Weatherby; F/O. A. E. Young; P/O. J. E. Zegarchuk.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—W/O. T. C. Guy.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. B. Bowling.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. B. W. Corrigan; W/O. R. G. McGregor.

MISSING.—Flt. Lt. R. McGregor.

South African Air Force

MISSING, BELIEVED KILLED IN ACTION.—Lt. A. L. Hawkes.

MISSING.—Lt. H. T. Funkey; Lt. J. J. Paola; W/O. D. P. Huskisson.